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BEFORE THE ARIZONA CORPORATION COMMISSION

IN THE MATTER OF THE APPLICATION OF BERMUDA WATER COMPANY, AN ARIZONA CORPORATION, FOR A DETERMINATION OF THE FAIR VALUE OF ITS UTILITY PLANTS AND PROPERTY AND FOR INCREASES IN ITS WATER RATES AND CHARGES FOR UTILITY SERVICE BASED THEREON.	DOCKET NO: W-01812A-10-0521 **NOTICE OF FILING REBUTTAL TESTIMONY**

Bermuda Water Company hereby submits this Notice of Filing Rebuttal Testimony in the above-referenced matter. Attached hereto as Exhibit A is the Rebuttal Testimony of Kirsten Weeks. Attached as Exhibit B is the Rebuttal Testimony of Pauline M. Ahern.

RESPECTFULLY SUBMITTED this 22nd day of September, 2011.

FENNEMORE CRAIG, P.C.

By _____
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Arizona Corporation Commission
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EXHIBIT A

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REBUTTAL TESTIMONY OF KIRSTEN WEEKS

Q. PLEASE STATE YOUR NAME, OCCUPATION AND BUSINESS ADDRESS FOR THE RECORD.

A. My name is Kirsten Weeks. I am employed as a Manager of Regulatory Accounting at Utilities, Inc., 2335 Sanders Road, Northbrook, Illinois 60062.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS CASE?

A. I am testifying in this proceeding on behalf of the applicant, Bermuda Water Company ("Bermuda" or "Company").

Q. ARE YOU THE SAME KIRSTEN WEEKS WHO FILED DIRECT TESTIMONY IN THIS DOCKET?

A. Yes. My direct testimony addressed the Company's application on the issues of rate base, income statement, rate design and cost of capital.

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. To respond to the direct testimony and recommendations filed by the Utilities Division Staff, Jeffrey M. Michlik on the issues of rate base, operating revenues and expenses, revenue requirement, rate of return and rate design, and Marlin Scott Jr. on engineering analysis. In addition, I will address the direct testimony submitted by William Rigsby on behalf of the Residential Utility Consumers Office ("RUCO") concerning his proposed hypothetical structure for Bermuda. The remainder of the Company's rebuttal to RUCO's cost of capital testimony will be addressed by Pauline M. Ahearn.

Q. MS. WEEKS, CAN YOU PLEASE SUMMARIZE YOUR REBUTTAL TO THE DIRECT TESTIMONY SUBMITTED BY MR. MICHLIK AND MR. SCOTT ON BEHALF OF STAFF?

A. Yes. Simply put, the Company is willing to accept all the analysis, adjustments and recommendations made by Staff in their direct testimony.

Q. SO YOU ARE WILLING TO ADOPT STAFF'S TESTIMONY ON THE ISSUES OF RATE BASE, OPERATING REVENUES AND EXPENSES, REVENUE REQUIREMENT, RATE OF RETURN, RATE DESIGN AND ENGINEERING AS YOUR OWN?

A. Yes, with a few minor caveats. First, although I am not an engineer, I do accept Marlin Scott's conclusions and recommendations contained in his direct testimony on behalf of the Company. Second, while Staff neither accepts, denies or recommends use of the leverage formula – as a cost of capital analysis – based on standards adopted by the Florida Public Service Commission, the Company is willing to withdraw its request for its adoption in this proceeding provided that all of Staff's recommendations are adopted.

Q. WHAT ABOUT THE COST OF CAPITAL ANALYSIS PROVIDED BY RUCO?

A. According to Mr. Rigsby, the reason why RUCO intervened in this proceeding was to address Bermuda's cost of capital approach proposed in its application, which was to adopt the leverage formula developed and adopted by the Florida Public Service Commission. See *Direct Testimony of William A. Rigsby* at p. 3, ln. 14 to p. 4, ln. 2. However, given that the Company is willing to withdraw its request to apply the Florida leverage formula in this proceeding, it would appear as if RUCO's intervention is no longer warranted.

Q. BUT RUCO DID PROVIDE EXTENSIVE COST OF CAPITAL TESTMONY TO SUPPORT ITS RECOMMENDATION TO REJECT THE FLORIDA PUBLIC SERVCIE COMMISSION LEVERAGE FORMULA, CORRECT?

A. Yes. And an extensive rebuttal is being submitted by the Company to demonstrate why Mr. Rigsby's analysis is incorrect in the event that the Commission chooses to adopt RUCO's cost of capital position in this proceeding. *Rebuttal Testimony of Pauline Ahearn*, CRRA, *AUS Consultants*. However, the Company expects that by removing the stated reason for RUCO's intervention, the parties can avoid extensive cost of capital testimony and cross-examination during the hearing.

Q. ASSUMING THAT BERMUDA'S COST OF CAPITAL IS ADDRESSED BY RUCO DURING THE HEARING, IS THERE ANYTHING ELSE YOU WANT TO ADDRESS CONCERNING MR. RIGSBY'S COST OF CAPITAL TESTIMONY?

A. Yes, I would like to address one more issue – the Company's capital structure. Mr. Rigsby recommends that the Commission adopt a hypothetical capital structure for Bermuda that consists of 60% common equity and 40% debt. However, I believe that the Commission has previously accepted a 100% equity capital structure for other similarly situated utility companies in Arizona. Nothwithstanding the rebuttal testimony provided by Pauline Ahearn on behalf of the Company, using a capital structure that consists of 100% equity is appropriate in this case as well. The Company agrees with Mr. Michlik that a return on equity of 8.82% is reasonable given the financial and business risks associated with Bermuda.

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes.

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EXHIBIT B

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BEFORE THE ARIZONA CORPORATION COMMISSION

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REBUTTAL TESTIMONY OF PAULINE M. AHERN

SEPTEMBER 22, 2011

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Appendix A – Professional Qualifications of Pauline M. Ahern

Introduction

Q. Please state your name, occupation and business address.

A. My name is Pauline M. Ahern. I am a Principal of AUS Consultants. My business address is 155 Gaither Drive, Suite A, Mt. Laurel, New Jersey 08054.

Q. Please summarize your professional experience and educational background.

A. I have offered expert testimony on behalf of investor-owned utilities before twenty-six state regulatory commissions on rate of return issues, including but not limited to common equity cost rate, fair rate of return, capital structure issues, credit quality issues and the like. I am a graduate of Clark University, Worcester, MA, where I received a Bachelor of Arts degree with honors in Economics in 1973. In 1991, I received a Master of Business Administration with high honors and a concentration in finance from Rutgers University. The details of these appearances, my educational background, presentations I have given and articles I have co-authored are shown in Appendix A supplementing this testimony.

On a monthly basis, I also calculate and maintain the American Gas Association (A.G.A.) Gas Index under contract with the A.G.A., which serves as the benchmark against which the performance of the American Gas Index Fund (AGIF) is measured. The A.G.A. Gas Index and AGIF are a market capitalization weighted index and fund, respectively, comprised of the common stocks of the publicly traded corporate members of the A.G.A.

I am also the Publisher of AUS Utility Reports, responsible for supervising the production, publication, distribution and marketing of its various reports.

I am a member of the Society of Utility and Regulatory Financial Analysts

(SURFA) where I serve on its Board of Directors, having served two terms as President, from 2006 – 2008 and 2008 – 2010. Previously, I held the position of Secretary/Treasurer from 2004 – 2006. In 1992, I was awarded the professional designation "Certified Rate of Return Analyst" (CRRA) by SURFA, which is based upon education, experience and the successful completion of a comprehensive written examination.

I am also an associate member of the National Association of Water Companies, serving on its Finance/Accounting/Taxation Committee; a member of the Energy Association of Pennsylvania, formerly the Pennsylvania Gas Association; and a member of the American Finance and Financial Management Associations.

Q. What is the purpose of your testimony in this proceeding?

A. The purpose of this testimony is to rebut certain aspects of the direct testimony of William A. Rigsby, CRRA, relative to his recommended common equity cost rate. Specifically, I will address his proxy group selection; his Discounted Cash Flow Analysis (DCF); his Capital Asset Pricing Analysis (CAPM); his failure to reflect Bermuda Water Company's (Bermuda or the Company) increased business risk due to its smaller size relative to his proxy group; and, the lower financial risk reflected in his recommended capital structure ratios relative to his proxy group. Finally, I will address an appropriate common equity cost rate based upon the Florida 2011 Leverage Formula which was adopted by the Florida Public Service Commission on August 2, 2011. In the course of this rebuttal, I will correct Mr. Rigsby's DCF and CAPM analyses as well.

Q. Have you prepared an exhibit which supports your rebuttal testimony?

A. Yes. It has been identified as Exhibit No. 1 and consists of Schedules PMA-1 through PMA-9.

Common Equity Cost Rate

Proxy Group Selection

Q. Please comment upon Mr. Rigsby's selection of two proxy groups for his cost of common equity analysis.

A. Mr. Rigsby's DCF and CAPM analyses are based upon the market data of two samples of utility companies. The first is a proxy group of four publicly traded water companies selected followed by Value Line Investment Survey (Value Line) in its Standard Edition. Although American Water Works, Co., Inc. is also included in the standard edition of Value Line, Mr. Rigsby chose not to include it for unspecified reasons. Mr. Rigsby also utilized a second group of utilities, namely, a group of publicly traded natural gas distribution companies (LDCs) which are followed in Value Line's Standard Edition.

Although Mr. Rigsby did not include American Water Works Co., Inc. or those water companies followed by Value Line in its Small- and Mid-Cap Edition, I will limit my rebuttal to Mr. Rigsby's common equity cost rate based upon the four water companies. However, I do take exception to his use of an LDC group because LDCs are not comparable in risk to water utilities.

Q. Please define business risk and explain why it is important to the determination of a fair rate of return.

A. Business risk is the riskiness of a company's common stock without the use of debt and/or preferred capital. Examples of such general business risk to all utilities, i.e., water, electric and natural gas distribution, include the quality of management, the regulatory environment, customer mix and concentration of customers, service territory growth, capital intensity, size, and the like, which have a direct bearing on earnings.

Business risk is important to the determination of a fair rate of return because the greater the level of risk, the greater the rate of return investors demand, consistent with the basic financial precept of risk and return.

Q. What business risks face the water industry in general?

A. Water is essential to life and unlike electricity or natural gas, water is the only utility product which is ingested. Consequently, water quality is of paramount importance to the health and well-being of customers and subject to additional health and safety regulations. In addition, unlike many electric and natural gas utilities, water utilities serve a production function in addition to the delivery functions served by electric and gas utilities.

Water utilities obtain supply from wells, aquifers, surface water reservoirs, streams and rivers, or through water rights. Throughout the years, well supplies and aquifers have been environmentally threatened, with historically minor purification treatment having given way to major well rehabilitation, treatment or replacement. Simultaneously, environmental water quality standards have tightened considerably, requiring multiple treatments. In addition, drought, water source overuse, runoff, threatened species/habitat protection and other factors are limiting supply availability. As for water rights, their lives are typically finite with renewability uncertain. In the course of procuring water supplies and treating water so that it meets Safe Drinking Water Act standards, water utilities have an ever-increasing responsibility to be stewards of the environment from which supplies are drawn, in order to preserve and protect the natural resources of the United States.

Moreover, electric and natural gas companies, where transmission and distribution

is separate from generation, generally do not produce the electricity or natural gas which they transmit and distribute. In contrast, water utilities are typically vertically engaged in the entire process of acquiring supply, production (treatment) and distribution of water. Hence, water utilities require significant capital investment in sources of supply and production (wells and treatment facilities), in addition to transmission and distribution systems, both to serve additional customers and to replace aging systems, creating a major risk facing the water and wastewater utility industry.

Value Line Investment Survey[1] (Value Line) observes the following about the water utility industry:

> Some stocks here have gained momentum since our April report, as many in the investment community appear to be seeking shelter from looming global economic issues.
>
> Still, water utility stocks, for the most part, remain uninspiring at this time. Not a single one, sans American Water Works, is ranked favorably for Timeliness. Earnings growth was hard to come by in the first quarter, and burgeoning operating costs are likely to continue outpacing the revenue gains being generated by an improving regulatory environment.
>
> The long-term outlook is not much rosier, and growth prospects appear daunting. True, as discussed below, the safe and timely delivery of water is undeniable. However, many of the country's water systems are aging, increasing the need for repairs and maintenance. Most providers, meanwhile, are strapped for cash, and the financing activity required to maintain infrastructures will only dilute future earnings gains.
>
> * * *
>
> But while the demand picture painted above would have you rushing out to buy Water Utility stocks, the industry does have its warts. Infrastructures are old, and many are decrepit. They require significant maintenance and investment is unavoidable. These costs have escalated

[1] Value Line Investment Survey, July 22, 2011.

> into the hundreds of millions of dollars and are not likely to subside anytime soon. Unfortunately, most of the companies operating in this space are starved for cash. Balance sheets are debt-laden and meek on assets. Outside financing has become commonplace and will probably remain the only viable option for those looking to bring cash into the fold. That said, the increased share count and higher interest expense associated with these initiatives thwarts share-earnings and shareholder gains. The lack of cash also precludes most from growing their businesses via acquisitions, such as Aqua America has become known for. The industry is consolidating at a red-hot pace, and the bigger players are the ones that are benefiting. Although the capital constraints have yet to influence dividends, some companies may have to rethink the current payout ratios if the costs of doing business cannot be curbed.
>
> This industry is probably not for most. Share-price growth potential is not something that comes to mind when we think of water utility stocks because of its capital-intensive nature and financial constraints of most companies of its players.

In addition, because the water and wastewater industry is much more capital-intensive than the electric, natural gas or telephone industries, the investment required to produce a dollar of revenue is greater. For example, as shown on page 1 of Schedule PMA-1, it took $3.83 of net utility plant on average to produce $1.00 in operating revenues in 2010 for the water utility industry as a whole. In contrast, for the electric, combination electric and gas and natural gas utility industries, on average it took only $2.16, $1.70 and $1.27, respectively, to produce $1.00 in operating revenues in 2010. The greater capital intensity of water utilities is not a new phenomenon as water utilities have exhibited a consistently and significantly greater capital intensity relative to electric, combination electric and gas and natural gas utilities during the ten years ended 2010, as also shown on page 1 of Schedule PMA-1. As financing needs have increased over the last decade, the competition for capital from traditional sources has increased, making the need to maintain financial integrity and the ability to attract needed new capital

increasingly important. Because investor-owned water utilities typically do not receive federal funds for infrastructure replacement, the challenge to investor-owned water utilities is exacerbated and their access to financing is restricted, thus increasing risk.

The National Association of Regulatory Commissioners (NARUC) has also highlighted the challenges facing the water and wastewater industry stemming from its capital intensity. NARUC's Board of Directors adopted the following resolution in July 2006:[2]

> WHEREAS, To meet the challenges of the water and wastewater industry which may face a combined capital investment requirement nearing one trillion dollars over a 20-year period, the following policies and mechanisms were identified to help ensure sustainable practices in promoting needed capital investment and cost-effective rates: a) the use of prospectively relevant test years; b) the distribution system improvement charge; c) construction work in progress; d) pass-through adjustments; e) staff-assisted rate cases; f) consolidation to achieve economies of scale; g) acquisition adjustment policies to promote consolidation and elimination of non-viable systems; h) a streamlined rate case process; i) mediation and settlement procedures; j) defined timeframes for rate cases; k) integrated water resource management; l) a fair return on capital investment; *and* m) improved communications with ratepayers and stakeholders; *and*
>
> WHEREAS, Due to the massive capital investment required to meet current and future water quality and infrastructure requirements, adequately adjusting allowed equity returns to recognize industry risk in order to provide a fair return on invested capital was recognized as crucial…
>
> RESOLVED, That the National Association of Regulatory Utility Commissions (NARUC), convened in its July 2006 Summer Meetings in Austin, Texas, conceptually supports review and consideration of the innovative regulatory policies and practices identified herein as "best practices;" *and be it further*
>
> RESOLVED, That NARUC recommends that economic regulators consider and adopt as many as appropriate of the regulatory mechanisms identified herein as best practices…

The water utility industry also experiences lower relative depreciation rates.

---

[2] "Resolution Supporting Consideration of Regulatory Policies Deemed as 'Best Practices'", Sponsored by the Committee on Water. Adopted by the NARUC Board of Directors, July 27, 2005.

Lower depreciation rates, as one of the principal sources of internal cash flows for all utilities, mean that water utility depreciation as a source of internally-generated cash is far less than for electric, combination electric and gas or natural gas utilities. Water utilities' assets have longer lives and, hence, longer capital recovery periods. As such, water utilities face greater risk due to inflation which results in a higher replacement cost per dollar of net plant than for other types of utilities. As shown on page 2 of Schedule PMA-1, water utilities experienced an average depreciation rate of 3.0% for 2010. In contrast, in 2010, the electric, combination electric and gas, natural gas or telephone industries, experienced average depreciation rates of 3.7%, 3.7% and 3.4%, respectively. As with capital intensity, the lower relative depreciation rates of water and wastewater utilities is not a new phenomenon. As also shown on page 2 of Schedule PMA-1, water utility depreciation rates have been consistently and much lower than those of the electric, combination electric and gas and natural gas utilities. Such low depreciation rates signify that the pressure on cash flows remains significantly greater for water utilities than for other types of utilities.

In addition, not only is the water utility industry historically capital intensive, it is expected to incur significant capital expenditure needs over the next 20 years. Prior to the recent economic and capital market turmoil, Standard & Poor's (S&P) noted[3]:

> Standard & Poor's expects the already capital-intensive water utility industry to become even more so over the next several years. Due to the aging pipeline infrastructure and more stringent quality standards, the U.S. Environmental Protection Agency's (EPA) foresees a need for $277 billion to upgrade and maintain U.S. water utilities through 2022, with about

[3] Standard & Poor's, Credit Outlook For U.S. Investor-Owned Water Utilities Should Remain Stable in 2008 (January 31, 2008) 2, 4.

$185 billion going toward infrastructure improvements. In addition, about $200 billion will be needed for wastewater applications, which suggests increased capital spending to be a long-term trend in this industry.

In line with these trends, many companies have announced aggressive capital spending programs. Forecast capital spending primarily focuses on infrastructure replacements and growth initiatives. Over the past five years, capital spending has been equivalent to about three times its depreciation expense. However, companies are now forecasting spending to be at or above four times depreciation expense over the intermediate term. For companies in regulatory jurisdictions that provide timely cost recovery for capital expenditures, the increased spending is likely to have a minimal effect on financial metrics and ratings. However, companies in areas without these mechanisms, earnings, and cash flow could be negatively affected by the increased spending levels, which over the longer term could harm a company's overall credit profile.

Due to the high level of capital spending, U.S. investor-owned water utilities do not generate positive free cash flow. This, coupled with the forecast increase in capital spending over the intermediate term, will require additional access to capital markets. We expect rated water companies to have enough financial flexibility to gain that access. Ratings actions shouldn't result from this increased market activity because we expect companies to use a balanced financing approach, which should maintain debt near existing levels.

Specifically, the EPA states the following[4]:

The survey found that the total nationwide infrastructure need is $334.8 billion for the 20-year period from January 2007 through December 2026. With $200.8 billion in needs over the next 20 years, transmission and distribution projects represent the largest category of need. This result is consistent with the fact that transmission and distribution mains account for most of the nation's water infrastructure. The other categories, in descending order of need are: treatment, storage, source and a miscellaneous category of needs called "other". The large magnitude of the national need reflects the challenges confronting water systems as they deal with an infrastructure network that has aged considerably since these systems were constructed, in many cases, 50 to 100 years ago.

[4] "Fact Sheet: "EPA's 2007 Drinking Water Infrastructure Needs Survey and Assessment", United States Environmental Protection Agency, Office of Water, February 2009, 1.

In its 2009 infrastructure Fact Sheet[5] published by the American Society of Civil Engineers (ASCE) they state:

> America's drinking water systems face an annual shortfall of at least $11 billion to replace aging facilities that are near the end of their useful lives and to comply with existing and future federal water regulations. This does not account for growth in the demand for drinking water over the next 20 years. Leaking pipes lose an estimated 7 billion gallons of clean drinking water a day.

Water utility capital expenditures as large as projected by the EPA and ASCE will require significant financing. The three sources typically used for financing are debt, equity (common and preferred) and cash flow. All three are intricately linked to the opportunity to earn a sufficient rate of return as well as the ability to achieve that return. Consistent with the *Bluefield* and *Hope* decisions discussed above, the return must be sufficient enough to maintain credit quality as well as enable the attraction of necessary new capital, be it debt or equity capital. If unable to raise debt or equity capital, the utility must turn to either retained earnings or free cash flow, both of which are directly linked to earning a sufficient rate of return. If either is inadequate, it will be nearly impossible for the utility to invest in needed infrastructure. Since all utilities typically experience negative free cash flows, it is clear that an insufficient rate of return can be financially devastating for utilities and for its customers, the ratepayers. Page 3 of Schedule PMA-1 demonstrates that the free cash flows (funds from operations minus capital expenditures) of water utilities as a percent of total operating revenues has been consistently more negative than that of the electric, combination electric and gas and natural gas utilities for

[5] 2009 American Society of Civil Engineers, Report Card for America's Infrastructure 2009.

the ten years ended 2010. Magnifying the impact of water utilities' negative free cash flow position is a continued inability to achieve what may already be an insufficient authorized rate of return on common equity, as will be discussed subsequently.

Consequently, as with the previously discussed capital intensity and depreciation rates, significant capital expenditures relative to net plant as well as the consistently and more significantly negative free cash flow relative to operating revenues of water utilities indicates greater investment risk for water utilities relative to electric, combination electric and gas and natural gas utilities.

In view of the foregoing, it is clear that the water utility industry's high degree of capital intensity, low depreciation rates and significant negative free cash flow, coupled with the need for substantial infrastructure capital spending, requires regulatory support in the form of adequate and timely rate relief, as recognized by NARUC, so water utilities will be able to successfully meet the challenges they face.

Q. Are there other indications that the water utility industry exhibits more investment risk than the electric, combination electric and gas and natural gas utility industries?

A. Yes. Pages 4-13 of Schedule PMA-1 also present several such indications: total debt / earnings before interest, taxes, depreciation and amortization (EBITDA); funds from operations (FFO) / total debt; funds from operations / interest coverage; before-income tax / interest coverage; earned returns on common equity (ROEs) and earned v. authorized ROEs for each utility industry for the ten years ended 2010. The increasing proportion of total debt to EBITDA for the water utilities indicates significantly increasing and greater financial risk for water utilities, which began the most recent ten

years below that of electric, combination electric and gas and natural gas utilities.

As noted above, S&P evaluates total debt as a percentage of EBITDA and FFO as a percentage of debt in the bond / credit rating process. Page 4 of Schedule PMA-1 shows that total debt / EBITDA has risen steadily for water utilities for the ten years ended 2010, dropping only slightly for 2010. Notwithstanding the decline in 2010, total debt / EBITDA is now higher than that for electric, combination electric and gas and natural gas utilities. Page 5 shows that FFO / total debt has steadily declined for water utilities over the decade ending 2010, while rising for the other utility groups. The consistently low level of FFO / total debt for the water utilities, is a further indication of the pressures upon water utility cash flows and the increased relative investment risk which the water utility industry faces.

Pages 6 and 7 of Schedule PMA-1 confirm the pressures upon both cash flows and income faced by water utilities. Page 6 shows that FFO / interest coverage for water, electric, combination electric and gas and natural gas utilities followed a similar pattern to FFO interest coverage for the ten years ended 2010. FFO interest coverage remained relative consistent for water utilities, rising and falling between 2.0 and 3.0 times during the period. A similar pattern was exhibited by electric utilities. However, FFO / total debt for combination electric and gas as well as natural gas utilities rose during the ten years, exceeding that of water utilities significantly in 2009 and dropping back somewhat in 2010. Page 7 shows that before-income tax coverage interest coverage for water utilities also remained relatively stable, falling below that of gas utilities in 2002 and below that of electric and combination electric and gas utilities between 2005 and 2006, where it remained for the remainder of the ten years. In 2010, in all likelihood due to the "Great

Recession" and the economy's nascent, fragile recovery from it, before-income tax interest coverage for water, electric and combination electric and gas utilities has converged at slightly lower than 3.0 times, while natural gas utilities continue to enjoy a significantly greater before-income tax interest coverage of approximately 4.25 times in 2010. Once again, the consistency and relatively low level of interest coverage ratios for water utilities are further indications of the pressures upon cash flow which water utilities face, confirming greater investment risk for water utilities relative to electric, combination electric and gas and natural gas utilities.

A final indication of the relative investment risk of water utilities compared with electric, combination electric and gas and natural gas utilities, are trends in earned and authorized ROEs. As shown on page 9 of Schedule PMA-1, earned ROEs, on average, for water utilities have generally been below those of electric, combination electric and gas and natural gas utilities during the ten years ended 2010. They have consistently been lower for the last five years. However, such a comparison would not be complete without a comparison of earned ROEs with authorized ROEs, as shown on pages 10 through 13 of Schedule PMA-1. The authorized ROEs are those reported in AUS Utility Reports for the last month of each year representing the authorized ROEs in effect during the previous year, rather than the outcomes of rate cases decided during the year. Hence, these authorized ROEs represent the revenue requirements of each year which give rise to the earned ROEs in each year. Water utilities generally, consistently and dramatically earned far below their authorized ROEs, while electric and combination electric and gas utilities earned above their authorized ROEs in some years and below in others. In contrast, natural gas utilities generally, consistently and dramatically earned above their

authorized ROEs. Notwithstanding the closing of the gap between the average authorized ROEs for the various utility groups over the ten year period, for the majority of the period, water utilities have failed to earn their average authorized ROE with earned ROEs significantly lower than authorized, a likely contributing factor to the greater risk indicated by the previously discussed coverage metrics.

In view of all of the foregoing, it is clear that the investment risk of water utilities has increased over the most recent ten years and that water utilities currently face greater investment risk relative to electric, combination electric and gas and natural gas utilities. Therefore, Mr. Rigsby should have limited his analysis to the proxy group of four water utilities.

Q. Does Bermuda face additional business risk?

A. Yes. Bermuda faces additional extraordinary business risk due to its smaller size relative to the proxy group. As discussed above, the greater the level of risk, the greater the rate of return demanded / required by investors, consistent with the basic financial precept of risk and return. Therefore an upward adjustment to the corrected common equity cost rate is necessary to reflect the smaller size of Bermuda and will be discussed subsequently.

Q. Please explain how Bermuda's smaller size increases its business risk relative to the proxy groups.

A. As will be discussed subsequently, Bermuda's smaller size, $19.012 million in estimated market capitalization relative to the average market capitalization of $1.209 billion for the four water companies, shown on page 1 of Schedule PMA-8, indicates greater relative business risk because all else equal, size has a bearing on risk. It is clear, too, that on a

relative basis, water utilities on average are smaller in terms of market capitalization than electric, combination electric and gas and natural gas utilities, as demonstrated on page 5 of Schedule PMA-1, which shows the market capitalization of each utility for the ten years ended 2010.

Q. Please explain why size has a bearing on business risk.

A. It is conventional wisdom, supported by actual returns over time, that smaller companies tend to be more risky causing investors to expect greater returns as compensation for that risk. Smaller companies are simply less able to cope with significant events which affect sales, revenues and earnings. For example, in general, the loss of revenues from a few larger customers would have a greater effect on a small company than on a much larger company with a larger, more diverse, customer base. Moreover, smaller companies are generally less diverse in their operations as well as experiencing less financial flexibility. In addition, the effect of extreme weather conditions, i.e., prolonged droughts or extremely wet weather, will have a greater affect upon a small operating water utility than upon the much larger, more geographically diverse holding companies.

Further evidence of the risk effects of size include the fact that investors demand greater returns to compensate for the lack of marketability and liquidity of the securities of smaller firms. That it is the use of funds invested and not the source of those funds which gives rise to the risk of any investment is a basic financial principle[6]. Therefore, because Bermuda is the regulated utility to whose jurisdictional rate base the overall cost of capital allowed by the Commission will be applied, the relevant risk reflected in the

[6] Brealey, Richard A. and Myers, Stewart C., Principles of Corporate Finance (McGraw-Hill Book Company, 2006) 204-205.

cost of capital must be that of Bermuda, including the impact of its small size on common equity cost rate. As noted above, Bermuda is smaller than the average proxy group company based upon the results of a study of the market capitalization of the four water companies as shown on Schedule PMA-8.

In addition, Brigham[7] states:

> A number of researchers have observed that portfolios of small-firms have earned consistently higher average returns than those of large-firms stocks; this is called "small-firm effect." On the surface, it would seem to be advantageous to the small firms to provide average returns in a stock market that are higher than those of larger firms. In reality, it is bad news for the small firm; what *the small-firm effect means is that the capital market demands higher returns on stocks of small firms than on otherwise similar stocks of the large firms.* (italics added)

Financial Risk

Q. Please define financial risk and explain why it is important to the determination of a fair rate of return.

A. Financial risk is the additional risk created by the introduction of senior capital, i.e., debt and preferred stock, into the capital structure. The higher the proportion of senior capital in the capital structure, the higher the financial risk which must be factored into the common equity cost rate, consistent with the previously mentioned basic financial principle of risk and return, i.e., investors demand a higher common equity return as compensation for bearing higher investment risk.

As will be discussed below, Mr. Rigsby's recommended capital structure ratios consisting of 40% long-term debt and 60% common equity are less financially risky than his average proxy water company. Therefore, it is necessary to reflect the lower financial

[7] Brigham, Eugene F., Fundamentals of Financial Management, Fifth Edition (The Dryden Press, 1989) 623.

risk of his recommended common equity ratio in a corrected common equity cost rate, as will be discussed subsequently. In addition, should the Commission decide to utilize the Florida Leverage Formula updated for 2011 but adopt Mr. Rigsby's recommended capital structure ratios, I will demonstrate how his recommended common equity cost rate of 9.00% does not reflect greater financial risk relative to Bermuda's actual capital structure which consists of 100% common equity.

The Efficient Market Hypothesis (EMH)

Q. Please describe the conceptual basis of the EMH.

A. The EMH, which is the foundation of modern investment theory, was pioneered by Eugene F. Fama[8] in 1970. An efficient market is one in which security prices reflect all relevant information all the time, with the implication that prices adjust instantaneously to new information, thus reflecting the intrinsic fundamental economic value of a security.[9]

The generally-accepted "semistrong" form of the EMH asserts that all publicly available information is fully reflected in securities prices, i.e., that fundamental analysis cannot enable an investor to "out-perform the market" in the long-run as noted by Brealey and Myers[10]. The "semistrong" form of the EMH is generally held to be true because the use of insider information often enables investors to earn excessive returns by "outperforming the market" in the short-run. This means that all perceived risks and publicly-available information are taken into account by investors in the prices they pay

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8 Fama, Eugene F., "Efficient Capital Markets: A Review of Theory and Empirical Work" (Journal of Finance, May 1970) 383-417.

9 Morin, Roger A., New Regulatory Finance (Public Utility Reports, Inc., 2006) 279-281.

10 Brealey, Richard A. and Myers, Stewart C., Principles of Corporate Finance First Edition, (McGraw-Hill, 1996) 329.

for securities, such as bond/credit ratings, discussions about companies by bond/credit rating agencies and investment analysts as well as the discussions of the various common equity cost rate methodologies (models) in the financial literature. In an attempt to emulate investor behavior, a limited number of common equity cost rate models, such as one or two, should not be relied upon exclusively in determining a cost rate of common equity and the results of multiple cost of common equity models should be taken into account. In addition, the academic literature provides substantial support for the need to rely upon multiple cost of common equity model in arriving at a recommended common equity cost rate.[11]

Q. Are the cost of common equity models Mr. Rigsby uses market-based models, and hence based upon the EMH?

A. Yes. The DCF model is market-based in that market prices are utilized in developing the dividend yield component of the model. The CAPM is market-based in that risk-free rate is market-based and the use of betas to determine the equity risk premium also reflects the market's assessment of market/systematic risk as betas are derived from regression analyses of market prices. Therefore, the cost of common equity models Mr. Rigsby utilized are market-based models, and hence based upon the EMH.

Discounted Cash Flow Model (DCF)

Q. What is the theoretical basis of the DCF model?

A. The theory underlying the DCF model is that the present value of an expected future

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[11] Morin 428-431.
Brigham, Eugene F. and Gapenski, Louis C., Financial Management – Theory and Practice Fourth Edition, (The Dryden Press, 1985) 256.
Brigham, Eugene F. and Daves, Phillip R., Intermediate Financial Management, (Thomson-Southwestern,

stream of net cash flows during the investment holding period can be determined by discounting those cash flows at the cost of capital, or the investors' capitalization rate. DCF theory indicates that an investor buys a stock for an expected total return rate which is derived from cash flows received in the form of dividends plus appreciation in market price (the expected growth rate). Mathematically, the dividend yield on market price plus a growth rate equals the capitalization rate, i.e., the total common equity return rate expected by investors.

Q. Please comment on the applicability of the DCF model in establishing a cost of common equity for Bermuda.

A. The extent to which the DCF is relied upon should depend upon the extent to which the cost rate results differ from those resulting from the use of other cost of common equity models because the DCF model has a tendency to mis-specify investors' required return rate when the market value of common stock differs significantly from its book value. Mathematically, because the "simplified" DCF model traditionally used in rate regulation assumes a market-to-book ratio of one, it understates/overstates investors' required return rate when market value exceeds/is less than book value. It does so because, in many instances, market prices reflect investors' assessments of long-range market price growth potentials (consistent with the infinite investment horizon implicit in the standard regulatory version of the DCF model) not fully reflected in analysts' shorter range forecasts of future growth for earnings per share (EPS) and dividends per share (DPS) accounting proxies. Thus, the market-based DCF model will result in a total annual dollar return on book common equity equal to the total annual dollar return

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2007) 332-333.

expected by investors only when market and book values are equal, a rare and unlikely situation. In recent years, the market values of utilities' common stocks have been well in excess of their book values as shown on page 1 of Schedule PMA-8 ranging between 168.1% and 255.3% for Mr. Rigsby's proxy group of four water companies.

Roger A. Morin has confirmed this tendency of the DCF by stating[12]:

> The third and perhaps most important reason for caution and skepticism is that application of the DCF model produces estimates of common equity cost that are consistent with investors' expected return *only* when stock price and book value are reasonably similar, that is when the M/B is close to unity. As shown below, application of the standard DCF model to utility stocks *understates* the investor's expected return when the market-to-book (M/B) ratio of a given stock exceeds unity. This is particularly relevant in the capital market environment of the 1990s and 2000s, where utility stocks are trading at M/B ratios well above unity and have been for nearly two decades. The converse is also true, that is, the DCF model overstates that investor's return when the stock's M/B ratio is less than unity. The reason for the distortion is that the DCF market return is applied to a book value rate base by the regulator, that is, a utility's earnings are limited to earnings on a book value rate base. (italics added)

Under the DCF model, the rate of return investors require is related to the price paid for a security. Thus, market prices form the basis of investment decisions and investors' expected rates of return. In contrast, a regulated utility is limited to earning on its net book value (depreciated original cost) rate base. Market values can diverge from book values for a myriad of reasons including, but not limited to, earnings per share (EPS) and dividends per share (DPS) expectations, merger / acquisition expectations, interest rates, etc. Thus, when market values are grossly disparate from their book values, a market-based DCF cost rate applied to the book value of common equity will not reflect investors' expected common equity cost rate. It will either overstate the

[12] Roger A. Morin, New Regulatory Finance, Public Utility Reports, 2006, 434.

common equity cost rate (without regard to any adjustment for flotation costs which may, at times, be appropriate) when market value is less than book value or understate the cost rate when market value is, as here, above book value.

This indicates the need to better match market prices with investors' longer range growth expectations embedded in those prices. However, the understatement / overstatement of investors' required return rate associated with the application of the market price-based DCF model to the book value of common equity clearly illustrates why reliance upon a single common equity cost rate model should be avoided.

Q. Is it reasonable to expect the market values of utilities' common stocks to continue to sell well above their book values?

A. Yes. I believe that the common stocks of utilities will continue to sell substantially above their book values, because many investors, especially individuals who traditionally committed less capital to the equity markets, will likely continue to commit a greater percentage of their available capital to common stocks in view of lower interest rate alternative investment opportunities and to provide for retirement. The recent past and current capital market environment is in stark contrast to the late 1970's and early 1980's when very high (by historical standards) yields on secured debt instruments in public utilities were available. Despite the fact the U. S. / global economies and capital markets are recovering falteringly from the recent "Great Recession," utility stocks have continued to sell at market prices well above their book values.

Traditional rate base/rate of return regulation, where a market-based common equity cost rate is applied to a book value rate base, presumes that market-to-book ratios are one. However, there is ample empirical evidence over sustained periods which

demonstrate that this is an incorrect presumption. Market-to-book ratios of one are rarely the case as there are many factors affecting the market price of common stocks, in addition to earnings. Moreover, allowed ROEs have a limited effect on utilities' market/book ratios as market prices of common stocks are influenced by a number of other factors beyond the direct influence of the regulatory process.

For example, Phillips[13] states:

> Many question the assumption that market price should equal book value, believing that 'the earnings of utilities should be sufficiently high to achieve market-to-book ratios which are consistent with those prevailing for stocks of unregulated companies.'

In addition, Bonbright[14] states:

> In the first place, commissions cannot forecast, except within wide limits, the effect their rate orders will have on the market prices of the stocks of the companies they regulate. In the second place, *whatever the initial market prices may be, they are sure to change not only with the changing prospects for earnings, but with the changing outlook of an inherently volatile stock market.* In short, market prices are beyond the control, though not beyond the influence of rate regulation. Moreover, even if a commission did possess the power of control, any attempt to exercise it ... would result in harmful, uneconomic shifts in public utility rate levels. (italics added)

In view of the foregoing, a mismatch results in the application of the DCF model as market prices reflect long range expectations of growth in market prices (consistent with the presumed infinite investment horizon of the standard DCF model), while the short range forecasts of growth in accounting proxies, i.e., EPS and DPS, do not reflect

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[13] Charles F. Phillips, Jr., The Regulation of Public Utilities-Theory and Practice, (Public Utility Reports, Inc., 1993) 395

[14] James C. Bonbright, Albert L. Danielsen and David R. Kamerschen, Principles of Public Utility Rates, 1988, Public Utilities Reports, Inc., Arlington, VA, p. 334.

the full measure of growth (market price appreciation) expected in per share market value.

Q. **On page 17, lines 11-13, Mr. Rigsby states that "[t]he market price of a utility's common stock will tend to move toward book value, or a market-to-book ratio of 1.0, if regulators allow a rate of return that is equal to the cost of capital." Please comment.**

A. Such a statement assumes that there is a direct relationship between earnings and market-to-book ratios. In addition, such a statement is inconsistent with the fact discussed above that "market prices are beyond the control, though not beyond the influence of rate regulation." As also noted above, there are many factors affecting market prices, in addition to earnings.

In the competitive environment, there is no evidence of any direct and exclusive relationship between market-to-book ratios and earned return on common equity (ROE), which for public utilities is based upon the authorized ROE. While traditional rate base/rate of return regulation presumes that market-to-book ratios equal one, there is ample empirical evidence over sustained periods of time which demonstrate that this is an incorrect presumption as discussed in my prepared direct testimony at pages 31 through 35.

Since regulation acts as a surrogate for competition, it is reasonable to look to the competitive environment for evidence of a direct relationship between market-to-book ratios and earned ROE. To determine if his contention of such a direct relationship has any merit, I observed the market-to-book ratios and the earned ROEs for the S&P Industrial Index and the S&P 500 Composite Index over a long period of time. On

Schedule PMA-2 I have shown the market-to-book ratios, earned ROEs, annual inflation rates and ROEs net of the annual rates of inflation for each year from 1947 through 2010, the latest year for which the information is available. In only one year, 1949, did the S&P Industrials have a market-to-book ratio of 1.00 time. In all of the other years, the market-to-book ratios exceeded 1.00 time. In no year did the market-to-book ratio fall below 1.00 time. In 1949, the only year the market-to-book ratio was 1.00 (or 100%), the real rate of earnings on book equity, adjusted for deflation, was 18.1% (16.3% + 1.8%). In contrast, in 1961, the S&P Industrials had a market-to-book ratio of 2.01 times, while experiencing a rate of earnings on book equity (adjusted for inflation) of only 9.1% (9.8% - 0.7%). In 2010, the estimated average market-to-book ratio of the S&P 500 Composite was 1.92 times, while the average rate of earnings on book equity (adjusted for inflation) was 10.9%.

The foregoing information, and all of the information shown on Schedule PMA-2 shows that competitive unregulated companies have never sold below book value, on average and have sold at their book value in only one year since 1947. These data also show that there is no relationship between ROE (either the nominal rate or the real earnings rate, i.e., the nominal rate less inflation or plus deflation for the only two years in which deflation occurred, 1949 and 1954 and the market-to-book ratio. It is illogical that investors would pay 2.56 times book value to earn an ROE net of inflation of 13.8% in 1989, yet would pay 2.77 times book value to earn a rate, net of inflation, of only 7.7% in 1991.

Because of the nearly 65 years in the period, it cannot validly be argued that the expected trend would be different because the market-to-book ratios best relate to future

years. The foregoing data, and all of the data on Schedule PMA-2 demonstrate that Mr. Rigsby's comments are a distortion of reality

Q. Is it appropriate to apply Mr. Rigsby's DCF-derived water company common equity cost rate of 9.28% to the book value of common equity?

A. No. A DCF-derived common equity cost rate will understate the investors' required return when it is applied to a book value significantly lower than market value. Under the DCF model, the rate of return investors require is related to the price paid for a security. Because a regulated utility is limited to earning on its net book value (depreciated original cost) rate base and market values can diverge from book values for a myriad of reasons including a market-based DCF cost rate applied to the book value of common equity will not reflect investors' expected common equity cost rate when market values are grossly disparate from their book values.

Mr. Rigsby's water company DCF cost rate, 9.28% is based upon average adjusted dividend yield of 3.29% plus an average estimate of growth of 6.17%, as shown on Schedules WAR-2, WAR-3 and WAR-4. As can be derived from Schedule PMA-3, the average market to book ratio of Mr. Rigsby's water proxy group is 184.4% based upon the group's average market price of $24.403 and average book value of $13.236. I have demonstrated the inadequacy of Mr. Rigsby's DCF cost rate on Schedule PMA-3, which demonstrates that there is no realistic opportunity to earn the market-based rates of return on book value. In this example, the investor expects a total return rate of 9.28% for his water proxy group. The 9.28% market-based cost rate for the water proxy group implies an annual return of $2.265 consisting of $0.759 in dividends and $1.506 in growth (market-price appreciation). When the 9.28% return rate is applied to the average

book value of the proxy group, $13.236, the opportunities for total annual returns is just $1.228. With annual dividends of $0.759, there are opportunities to earn only $0.469 in market-price appreciation which is a mere 1.92% on market price in contrast to the 6.17% average growth in market price expected by investors for the group. There is no possible way to achieve the expected growth of $1.506 (6.17%) related to an average market price of $23.280, for the proxy group, absent a huge cut in annual cash dividends, an unreasonable expectation since such an action by a board of directors is usually indicative of an extremely adverse financial condition. Of course, if the converse situation exists (market prices substantially below their book values), a market-based DCF cost rate applied to the book value of common equity would overstate the cost rate.

Q. Do you agree with Mr. Rigby's reliance upon sustainable growth DCF analysis?

A. No. Mr. Rigsby's DCF growth rate utilizes the sustainable growth methodology for determining the growth rate component. He calculates sustainable growth for his proxy companies as derived on Schedule WAR-5 and summarized on Schedule WAR-4. On pages 1-4 Schedule WAR-5, it can be seen that the return on equity utilized in Mr. Rigsby's growth rate analysis is based upon both historical, 2011, 2012 and five-year expectations by Value Line.

If the Commission chooses to adopt Mr. Rigsby's sustainable growth methodology, given the economic and market turmoil of the last several years and the current faltering recovery, it is not reasonable to rely upon historical sustainable growth or even sustainable growth expected in the near future, 2011 and 2012. If one is to use the sustainable growth methodology, one should use the sustainable growth rates derived from the 2014-2016 Value Line projections shown on Schedule WAR-5.

Q. What would Mr. Rigsby's DCF results have been had he correctly relied upon projected internal growth.

A. As shown on Schedule PMA-4, the DCF result is for the four water companies 11.60% using projected sustainable, or internal, growth rates. However, a cost rate of 11.60% is understated because it does not reflect the additional business risk of Bermuda due to its smaller size or its lower financial risk relative to the water companies as discussed above.

The Capital Asset Pricing Model (CAPM)

Q. Please explain the theoretical basis of the CAPM.

A. CAPM theory defines risk as the covariability of a security's returns with the market's returns as measured by beta (β). A beta less than 1.0 indicates lower variability while a beta greater than 1.0 indicates greater variability than the market.

The CAPM assumes that all other risk, i.e., all non-market or unsystematic risk, can be eliminated through diversification. The risk that cannot be eliminated through diversification is called market, or systematic, risk. In addition, the CAPM presumes that investors require compensation only for these systematic risks which are the result of macroeconomic and other events that affect the returns on all assets. The model is applied by adding a risk-free rate of return to a market risk premium, which is adjusted proportionately to reflect the systematic risk of the individual security relative to the total market as measured by beta. The traditional CAPM model is expressed as:

$$R_s = R_f + \beta(R_m - R_f)$$

Where: R_s = Return rate on the common stock

R_f = Risk-free rate of return

R_m = Return rate on the market as a whole

β = Adjusted beta (volatility of the security relative to the market as a whole)

Numerous tests of the CAPM have measured the extent to which security returns and betas are related as predicted by the CAPM confirming its validity. The empirical CAPM (ECAPM) reflects the reality that while the results of these tests support the notion that beta is related to security returns, the empirical Security Market Line (SML) described by the CAPM formula is not as steeply sloped as the predicted SML. Morin[15] states:

> With few exceptions, the empirical studies agree that ... low-beta securities earn returns somewhat higher than the CAPM would predict, and high-beta securities earn less than predicted.
>
> * * *
>
> Therefore, the empirical evidence suggests that the expected return on a security is related to its risk by the following approximation:
>
> $$K = R_F + x\,\beta(R_M - R_F) + (1-x)\,\beta(R_M - R_F)$$
>
> where x is a fraction to be determined empirically. The value of x that best explains the observed relationship Return = 0.0829 + 0.0520 β is between 0.25 and 0.30. If x = 0.25, the equation becomes:
>
> $$K = R_F + 0.25(R_M - R_F) + 0.75\,\beta(R_M - R_F)$$[16]

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[15] Morin 175.

[16] Morin 190.

In view of theory and practical research, it is conservatively appropriate to apply the traditional CAPM and the ECAPM and average the results.

Q. Do you agree with Mr. Rigsby's application of the CAPM?

A. No. Mr. Rigsby's application of the CAPM is flawed for several reasons. First, he incorrectly relied upon an historical estimate of the yield on 5-year U.S. Treasury securities as the risk-free rate. Second, he relied, in part, upon the geometric mean historical large company stock return. Third, he relied upon the historical total returns on an intermediate-term U.S. Treasury security rather than the more correct income returns. Finally, he did not utilize the ECAPM as described above.

Q. Please comment upon Mr. Rigsby's selection of the risk-free rate.

A. Mr. Rigsby utilized an historical 8-week average yield on 5-year U.S. Treasury securities as stated in lines 10-14 on page 32 of his direct testimony. This is incorrect for two reasons. First, because both ratemaking and the cost of capital, including common equity, are prospective, the risk-free rate for a CAPM analysis should be forward looking. Second, using the yield on 5-year U.S. Treasury securities is not consistent with either the in perpetuity investment horizon assumed in the DCF model used by Mr. Rigsby, the concept of the long-term cost of capital or the life of the typical utility rate base.

Q. Why is the prospective yield on long-term U.S. Treasury Bonds appropriate for use as the risk-free rate?

A. The prospective yield is appropriate for use as the risk-free component in a CAPM analysis because it is consistent with the prospective nature of both ratemaking and the cost of capital. In addition, the yield on long-term U.S. Treasury T-Bonds is almost risk-

free and its term is consistent with the long-term cost of capital to public utilities measured by the yields on A rated public utility bonds, the long-term investment horizon inherent in utilities' common stocks, the long-term investment horizon presumed in the standard DCF model employed in regulatory ratemaking, and the long-term life of the jurisdictional rate base to which the allowed fair rate of return, i.e., cost of capital will be applied. In contrast, short-term U.S. Treasury yields are more volatile and largely a function of Federal Reserve monetary policy.

In addition, noted in the Ibbotson® SBBI® – 2011 Valuation Yearbook – Market Results for Stocks, Bonds, Bills and Inflation – 1926-2010 (SBBI – 2011)[17]:

> Although the equity risk premia of several horizons are available, the long-horizon equity risk premium is preferable for use in most business-valuation settings, even if an investor has a shorter time horizon. Companies are entities that generally have no defined life span; when determining a company's value, it is important to use a long-term discount rate because the life of the company is assumed to be infinite. For this reason, it is appropriate in most cases to use the long-horizon equity risk premium for business valuation.
>
> * * *
>
> The 30-year bond that the Treasury recently began issuing again is theoretically more correct due to the long-term nature of business valuation. . .

Q. Please comment upon Mr. Rigsby's calculation of the market equity risk premium.

A. Mr. Rigsby "used both a geometric and an arithmetic mean of the historical total returns on the S&P 500 index from 1926 to 2010 as the proxy for the market rate of return (R_m)" as stated on lines 6-9 on page 33 of his direct testimony. Mr. Rigsby then deducted "the

[17] Ibbotson® SBBI® – 2011 Valuation Yearbook – Market Results for Stocks, Bonds, Bills and Inflation – 1926-2010 (SBBI – 2011) 55.

geometric mean of the total returns on intermediate-term government bonds for the same eighty-four [sic] year period" as stated on lines 9-10 on page 33. This is incorrect for four reasons. First, the geometric mean is not appropriate for cost of capital purposes. Second, the intermediate-term government bond is not appropriate for cost of capital purposes as discussed above. Third, the use of total returns in the risk-free component of the market equity risk premium is not appropriate. Four, he did not utilize a forecasted market equity risk premium.

Q. Why is the geometric mean historical return inappropriate when estimating the cost of capital?

A. The arithmetic mean return rates and yields (income returns) are appropriate for cost of capital purposes as noted in the SBBI – 2011. Arithmetic mean return rates and yields are appropriate because ex-post (historical) total returns and equity risk premiums differ in size and direction over time, providing insight into the variance and standard deviation of returns. Because the arithmetic mean captures the prospect for variance in returns and equity risk premiums, it provides the valuable insight needed by investors in estimating future risk when making a current investment. Absent such valuable insight into the potential variance of returns, investors cannot meaningfully evaluate prospective risk. If investors alternatively relied upon the geometric mean of ex-post equity risk premiums, they would have no insight into the potential variance of future returns because the geometric mean relates the change over many periods to a constant rate of change, thereby obviating the year-to-year fluctuations, or variance, *critical to risk analysis.*

The financial literature is quite clear on this point, that risk is measured by the

variability of expected returns, i.e., the probability distribution of returns.[18] In addition, Weston and Brigham[19] provide the standard financial textbook definition of the riskiness of an asset when they state:

> The riskiness of an asset is defined in terms of the *likely variability of future returns from the asset.* (emphasis added)

And Morin states[20]:

> The geometric mean answers the question of *what constant return* you would have to achieve in each year to have your investment growth match the return achieved by the stock market. The arithmetic mean answers the question of what growth rate is the best estimate of the future amount of money that will be produced by continually reinvesting in the stock market. It is the rate of return which, compounded over multiple periods, gives the mean of the probability distribution of ending wealth. (emphasis added)

In addition, Brealey and Myers[21] note:

> The proper uses of arithmetic and compound rates of return from past investments are often misunderstood. . . . Thus the arithmetic average of the returns correctly measures the opportunity cost of capital for investments. . . . *Moral*: If the cost of capital is estimated from historical returns or risk premiums, use arithmetic averages, not compound annual rates of return. (italics in original)

Also, Giaacchino and Lesser[22] state:

> The appropriateness of using either a geometric or arithmetic mean depends on the context.[12](footnote omitted) If you are evaluating the past performance of a stock, the geometric mean is appropriate: it represents the compound average return over time.

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18 Brigham (1989) 639.

19 Weston, J. Fred and Brigham, Eugene F., Essentials of Managerial Finance Third Edition (The Dryden Press, 1974) 272.

20 Morin 133.

21 Brealey and Myers 146-147.

22 Giaacchino, Leonardo R. and Lesser, Jonathan A., Principles of Utility Corporate Finance (Public Utilities

> If, instead, you wish to estimate future growth, you need to use an arithmetic mean . . . compounding the stock at the arithmetic mean . . . gives us the expected (average) stock price . . . compounding at the geometric mean leads to the median stock price.

As previously discussed, investors gain insight into relative riskiness by analyzing expected future variability. This is accomplished by the use of the arithmetic mean of a distribution of returns / premiums. Only the arithmetic mean takes into account all of the returns / premiums, hence, providing meaningful insight into the variance and standard deviation of those returns / premiums.

Q. Can it be demonstrated that the arithmetic mean takes into account all of the returns and therefore, that the arithmetic mean is appropriate to use when estimating the opportunity cost of capital in contrast to the geometric mean?

A. Yes. Pages 1 through 3 of Schedule PMA-5 graphically demonstrate this premise. It is clear from observing the year-to-year variation (the returns on large company stocks for each and every year, 1926 through 2010 on page 1), that stock market returns, and hence, equity risk premiums, vary.

There is a clear bell-shaped pattern to the probability distribution of these returns shown on page 2, an indication that they are randomly generated and not serially correlated. The arithmetic mean of this distribution of returns considers each and every return in the distribution, taking into account the standard deviation or likely variance which may be experienced in the future when estimating the rate of return based upon such historical returns. In contrast, page 3 demonstrates that when the geometric mean is calculated, only two of the returns are considered, namely the initial and terminal years,

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Reports, Inc., 2011) 38-41 and 233-234.

i.e., 1926 and 2010. Based upon only those two years, a constant rate of return is calculated by the geometric average. That constant return is graphically represented by a flat line, showing no year-to-year variation, over the entire 1926 to 2010 time period, which is obviously far different from reality, based upon the probability distribution of returns shown on page 2 and demonstrated on page 1.

Consequently, only the arithmetic mean takes into account the standard deviation of returns which is critical to risk analysis. The geometric mean is appropriate only when measuring historical performance and should not be used to estimate the investors required rate of return.

Q. You stated earlier that it is incorrect to use the historical total return on U.S. Treasury securities as the risk-free component of the equity risk premium. Please comment.

A. Using the total return on U.S. Treasury securities is not appropriate as the risk-free component of the equity risk premium because it is not a truly risk-free rate. As indicated on pages 55 and 56 of the SBBI 2011 (pages 8 and 9 of Schedule PMA-5), it is:

> Another point to keep in mind when calculating the equity risk premium is that the income return on the appropriate-horizon Treasury security, rather than the total return, is used in the calculation. The total return is comprised of three return components: the income return, the capital appreciation return, and the reinvestment return. The income return is defined as the portion of the total return that results from a periodic cash flow or, in this case, the bond coupon payment. The capital appreciation return results from the price change of a bond over a specific period. Bond prices generally change in reaction to unexpected fluctuations in yields. Reinvestment return is the return on a given month's investment income when reinvested into the same asset class in the subsequent months of the year. The income return is thus used in the estimation of the equity risk premium because it represents the truly riskless portion of the return.[2] (footnote omitted)

* * * *

> Anticipated changes in yields are assessed by the market and figured into the price of a bond. Future changes in yields that are not anticipated will cause the price of the bond to adjust accordingly. Price changes in bonds due to unanticipated changes in yields introduce price risk into the total return. *Therefore, the total return on the bond series does not represent the riskless rate of return. The income return better represents the unbiased estimate of the purely riskless rate of return, since an investor can hold a bond to maturity and be entitled to the income return with no capital loss.* (italics added)

Hence, it is appropriate to use the income return and not the total return on long-term U.S. government bonds when calculating a market equity risk premium.

Q. You also stated earlier that Mr. Rigsby failed to utilize a forecasted market equity risk premium. Please comment.

A. Once again, because both ratemaking and the cost of capital, including the cost rate of common equity are prospective, a prospective market equity risk premium is essential. The basis of the forecasted or prospective market equity risk premium can be found on note 1 on page 2 of Schedule PMA-6. Consistent with the development of the risk-free rate component of Mr. Rigby's CAPM analysis, it is derived from an average of the most recent eight weeks ending August 12, 2011 3-5 year median market price appreciation potentials by Value Line plus an average of the median estimated dividend yield for the common stocks of the 1,700 firms covered in Value Line's Standard Edition.

The average median expected price appreciation is 59% which translates to a 12.29% annual appreciation and, when added to the average (similarly calculated) median dividend yield of 1.99% equates to a forecasted annual total return rate on the market as a whole of 14.28%. The forecasted total market equity risk premium of 9.61% is derived by deducting the August 1, 2011 Blue Chip Financial Forecasts consensus estimate of about

50 economists of the expected yield on 30-year U.S. Treasury Notes for the six calendar quarters ending with the fourth calendar quarter 2012 of 4.67% as derived in note 1 on page 2 of Schedule PMA-6 (9.61% = 14.28% - 4.67%).

Averaging this 9.61% Value Line forecasted equity risk premium with a correctly derived long-term historical market equity risk premium, i.e. using the arithmetic mean long-term historical total returns on large company common stocks and the arithmetic mean long-term historical income return on long-term U.S. Treasury securities, of 6.70% as derived in note 1 on page 2 of Schedule PMA-6 yields a market equity risk premium of 8.16% (8.16% = (9.61% + 6.70%)/2).

Q. What would be the results of an application of the traditional and empirical CAPM to Mr. Rigsby's proxy group using a correctly calculated risk-free rate and market equity risk premium as discussed above?

A. As shown on Schedule PMA-6, page 1, the average traditional CAPM cost rate is 10.79% for the four water companies and the average ECAPM cost rate is 11.30%. Thus, as shown on column 6 on page 1, the CAPM cost rate applicable to the proxy group of four water companies is 11.05% based upon an average of the traditional CAPM and ECAPM results for Mr. Rigsby's proxy group. However, a cost rate of 11.05% is still understated because it does not reflect the additional business risk of Bermuda due to its smaller relative size or its lower relative financial risk as discussed above.

Q. Does the use of adjusted betas in a traditional CAPM model render that model the equivalent of the ECAPM model?

A. No. Using adjusted betas in a CAPM analysis is not equivalent to the ECAPM. Betas are adjusted because of the general regression tendency of betas to converge toward 1.0 over

time, i.e., over successive calculations of beta. As noted above, numerous studies have determined that the SML described by the CAPM formula at any given moment in time is not as steeply sloped as the predicted SML. Morin[23] states:

> Some have argued that the use of the ECAPM is inconsistent with the use of adjusted betas, such as those supplied by Value Line and Bloomberg. This is because the reason for using the ECAPM is to allow for the tendency of betas to regress toward the mean value of 1.00 over time, and, since Value Line betas are already adjusted for such trend [sic], an ECAPM analysis results in double-counting. This argument is erroneous. Fundamentally, the ECAPM is not an adjustment, increase or decrease, in beta. This is obvious from the fact that the expected return on high beta securities is actually lower than that produced by the CAPM estimate. The ECAPM is a formal recognition that the observed risk-return tradeoff is flatter than predicted by the CAPM based on myriad empirical evidence. The ECAPM and the use of adjusted betas comprised two separate features of asset pricing. Even if a company's beta is estimated accurately, the CAPM still understates the return for low-beta stocks. Even if the ECAPM is used, the return for low-beta securities is understated if the betas are understated. Referring back to Figure 6-1, the ECAPM is a return (vertical axis) adjustment and not a beta (horizontal axis) adjustment. Both adjustments are necessary.

Moreover, the slope of the SML should not be confused with beta. As Brigham states[24] :

> The slope of the SML reflects the degree of risk aversion in the economy – the greater the average investor's aversion to risk, then (1) the steeper is the slope of the line, (2) the greater is the risk premium for any risky asset, and (3) the higher is the required rate of return on risky assets.[12]
>
> [12]Students sometimes confuse beta with the slope of the SML. This is a mistake. As we saw earlier in connection with Figure 6-8, and as is developed further in Appendix 6A, beta does represent the slope of a line, but *not* the Security Market Line. This confusion arises partly because the SML equation is generally written, in this book and throughout the finance

[23] Morin 191.

[24] Brigham and Gapenski 203.

literature, as $k_i = R_F + b_i(k_M - R_F)$, and in this form b_i looks like the slope coefficient and $(k_M - R_F)$ the variable. It would perhaps be less confusing if the second term were written $(k_M - R_F)b_i$, but this is not generally done.

Regulatory support for the ECAPM can be found in the New York Public Service Commission's Generic Financing Docket, Case 91-M-0509. Also, the Regulatory Commission of Alaska has stated[25]:

> Although we primarily rely upon Tesoro's recommendation, we are concerned, however, about Tesoro's CAPM analysis. Tesoro averaged the results it obtained from CAPM and ECAPM while at the same time providing empirical testimony[604] that the ECAPM results are more accurate then [sic] traditional CAPM results. The reasonable investor would be aware of these empirical results. Therefore, we adjust Tesoro's recommendation to reflect only the ECAPM result. (footnote omitted)

Thus, using adjusted betas in an ECAPM analysis is not incorrect nor inconsistent with either their financial literature or regulatory precedent. Notwithstanding empirical and regulatory support for the use of only the ECAPM, my CAPM analysis, which includes both the traditional CAPM and the ECAPM, is a conservative approach resulting in a reasonable estimate of the cost of common equity.

Q. What would Mr. Rigsby's recommended common equity cost rate based upon the corrections discussed above?

A. It is 10.32% based upon the common equity cost rates resulting from the application of a corrected DCF and CAPM to the four water companies, as adjusted for financial and business risks due to Bermuda's lower financial risk and smaller relative size.

The results of correcting Mr. Rigsby's DCF and CAPM applied to his four water companies are summarized below:

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[25] In the Matter of the Correct Calculation and Use of Acceptable Input Data to Calculate the 1997, 1998, 1999, 2000, 2001 and 2002 Tariff Rates for the Intrastate Transportation of Petroleum over the TransAlaska Pipeline System, Docket No P-97-4, Order No. 151, p. 146 (Reg. Comm'n AK 11/27/02).

Table 1

	Proxy Group of Four Water Companies
Discounted Cash Flow Model	10.60%
Capital Asset Pricing Model	11.05
Indicated Common Equity Cost Rate Before Adjustment for Financial Risk and Business Risk	11.33%
Financial Risk Adjustment	(0.98)
Business Risk Adjustment	0.50
Corrected Common Equity Cost Rate	10.85%

Based upon these corrected common equity cost rate results, a common equity cost rate of 11.33% is indicated for the four water companies before the financial and business risk adjustments previously discussed.

Financial Risk Adjustment

Q. Is there a way to quantify a financial risk adjustment due to Bermuda's previously discussed lower financial risk relative to the proxy group?

A. Yes. As shown on page 1 of Schedule WAR-1, Mr. Rigsby recommends a common equity ratio of 60.00% which is higher than the average 2010 total equity ratio maintained, on average, by the four water companies, 48.09% as shown on Schedule PMA-7. Conversely, Mr. Rigsby's recommended debt ratio of 40.00% is lower than the average 2010 long-term debt ratio of the proxy group, 51.91%. Thus, Bermuda has lower financial risk than the companies in his proxy group. Because investors require a higher /

lower return in exchange for bearing higher / lower risk, a downward adjustment to the common equity cost rate derived from the market data of the proxy group companies which have a higher degree of financial risk than Bermuda is necessary.

An indication of the magnitude of the necessary financial risk adjustment is given by the Hamada equation[26], which un-levers and then re-levers betas based upon changes in capital structure.

The Hamada equation un-levers the median beta of the proxy group of four water companies of 0.75 with an average December 31, 2010 total equity ratio of 48.09% to 0.40 when applied to a 100% common equity ratio and then levers the beta to 0.63 using Mr. Rigsby's recommended common equity ratio of 60.00%. The re-levered beta, applied to an 8.16% market risk premium and a 4.67% risk-free rate translates to a 9.81%[27] common equity cost rate. The difference between the 10.25% relevered beta common equity cost rate and the result of the traditional CAPM for the proxy group with a median beta of 0.75, 10.79%[28] is a negative 98 basis points (-0.98%). A downward financial adjustment of 98 basis points (-0.98%), reflects the lower financial risk of attributable to Mr. Rigsby's recommend higher equity ratio of 60.00% compared with the proxy group's average total equity ratio of 48.09% at December 31, 2010. The Hamada Equation and calculations are as follows:

$$b_l = b_u[1 + (1 - T)(D / S)]$$

Where b_l = Levered beta

b_u = Un-levered beta

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26 Brigham and Daves 533.

27 9.81% = (0.63 x 8.16%) + 4.67%.

28 10.79% = (0.75 x 8.16%) + 4.67%.

T = Tax Rate
(D/S) = Debt to Common Equity Ratio

To un-lever the beta from a 48.09% average proxy group total equity ratio, the following equation is used:

$$0.70 = b_u [1 + (1 - 0.35) (51.91\%/48.09\%)]$$

When solved for b_u, $b_u = 0.44$, indicating that the beta for the proxy group of four water companies would be 0.44 if their average capital structure contained 100% total equity.

To re-lever the beta relative to Mr. Rigsby's recommended 60.00% common equity ratio, the following equation is used:

$$b_l = 0.40 [1 + (1 - 0.35) (40.00\%/60.00\%)]$$

When solved for b_l, $b_l = 0.63$, indicating that the beta for the proxy group of four water companies would be 0.63, if their average capital structure contained 60.00% common equity.

Business Risk Adjustment

Q. Is there a way to quantify a business risk adjustment due to Bermuda's small size relative to the proxy group as discussed above?

A. Yes. As discussed above, the Company has greater business risk than the average company in Mr. Rigsby's proxy group because of its smaller size relative to the group, measured by either book capitalization or the market capitalization of common equity (estimated market capitalization for Bermuda, whose common stock is not traded).

Table 2

	Market Capitalization(1) ($ Millions)	Times Greater than the Company
Bermuda Water Co.	$19.012	
Proxy Group of Four Water Companies	1,208.594	63.6x

(1) From page 1 of Schedule PMA-8.

Because the Company's common stock is not publicly traded, I have assumed that if it were, the common shares would be selling at the same market-to-book ratio as the average market-to-book ratio for Mr. Rigsby's proxy group, 192.6%, as shown on page 2 of Schedule PMA-8. Since Mr. Rigsby's recommended common equity cost rate is based upon the market data of his proxy group, it is reasonable to use the market-to-book ratios of the proxy group to estimate Bermuda's market capitalization. Hence, the Company's market capitalization is estimated at $19.012 million based upon the average market-to-book ratio of his proxy group. In contrast, the market capitalization of the average water company in Mr. Rigsby's proxy group was $1.209 billion on August 12, 2011, or 63.6 times the size of Bermuda's estimated market capitalization.

Therefore, it is necessary to upwardly adjust the common equity cost rate of 10.80% based upon the four water companies to reflect Bermuda's greater risk due to its smaller relative size. The determination is based upon the size premiums for decile portfolios of New York Stock Exchange (NYSE), American Stock Exchange (AMEX) and NASDAQ listed companies for the 1926-2010 period and related data from SBBI-2011. The average size premium for the decile in which Mr. Rigsby's proxy group falls

has been compared with the average size premium for the decile in which the market capitalization of Bermuda would fall if its stock were traded and sold at an average market/book ratio of 192.6% experienced by the proxy group. As shown on page 1, because Bermuda falls in the 10th decile and the four water companies fall between the 6th and 7th deciles, the size premium spread between the Company and the four water companies is 4.51 basis points (4.51%).

In view of the foregoing, although the SBBI 2011 study indicates that a 4.51% adjustment is warranted, I recommend a conservative upward adjustment of 50 basis points (0.50%) to reflect Bermuda's greater relative business risk due to its smaller size. A business risk adjustment of 50 basis points (0.50%) coupled with the previously discussed financial risk adjustment of a negative 98 basis points (-0.98%), when added to the 11.33% indicated common equity cost rate based upon the four water companies before adjustment, results in a financial risk and business risk-adjusted corrected common equity cost rate of 10.85%[29].

A common equity cost rate of 10.85%, when applied to Mr. Rigsby's recommended common equity ratio of 60.00%, results in an overall rate of return of 8.96%.

Q. Please summarize your corrections to Mr. Rigsby's cost of common equity analysis.

A. Schedule PMA-9 presents a comparison of Mr. Rigsby's recommended overall rate of return, common equity cost rate, DCF and CAPM analysis with the corrections to those analyses discussed above. Page 1 presents the overall rate of return of 8.96% resulting

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[29] 10.85% = 11.33% - 0.98% + 0.50%.

from the 10.85% corrected common equity cost rate in contrast to Mr. Rigsby's recommended overall rate of return of 7.85%. Page 2 presents a detailed summary of the Mr. Rigsby's DCF and CAPM analyses side by side with the corrections to those analyses discussed above.

Q. What would be the Florida Leverage Formula ROE applicable to Mr. Rigsby's recommended ratemaking common equity ratio of 60.00%?

A. It would be 9.813%. Mr. Rigsby has provided the recommended 2011 Florida Leverage Formula as Exhibit 1. On page 1 of Attachment 1, in Exhibit 1, the 2011 Leverage Formula (Recommended) is to be calculated as 7.13% + 1.610 / ER, with "ER" being the equity ratio. When solved for an equity ratio of 60.00%, Mr. Rigsby's recommended ratemaking common equity ratio for Bermuda, a 9.81% common equity cost rate results (9.81% = 7.13% + (1.610 / 60.00%)).

Q. Does that conclude your direct testimony?

A. Yes.

APPENDIX A

PROFESSIONAL QUALIFICATIONS

OF

PAULINE M. AHERN, CRRA
PRINCIPAL

AUS CONSULTANTS

PROFESSIONAL QUALIFICATIONS
OF
PAULINE M. AHERN, CRRA
PRINCIPAL
AUS CONSULTANTS

PROFESSIONAL EXPERIENCE

1994-Present

In 1996, I became a Principal of AUS Consultants, continuing to offer testimony as an expert witness on the subjects of fair rate of return, cost of capital and related issues before state public utility commissions. I provide assistance and support to clients throughout the entire ratemaking litigation process. In addition, I supervise the financial analyst and administrative staff in the preparation of fair rate of return and cost of capital exhibits which are filed along with expert testimony before various state and federal public utility regulatory bodies. The team also assists in the preparation of interrogatory responses, as well as rebuttal exhibits.

As the Publisher of AUS Utility Reports (formerly C. A. Turner Utility Reports), I am responsible for the production, publishing, and distribution of the reports. AUS Utility Reports provides financial data and related ratios for about 120 public utilities, i.e., electric, combination gas and electric, natural gas distribution, natural gas transmission, telephone, and water utilities, on a monthly, quarterly and annual basis. Among the subscribers of AUS Utility Reports are utilities, many state regulatory commissions, federal agencies, individuals, brokerage firms, attorneys, as well as public and academic libraries. The publication has continuously provided financial statistics on the utility industry since 1930.

As the Publisher of AUS Utility Reports, I also supervise the production, publishing, and distribution of the AGA Rate Service publications under license from the American Gas Association. I am also responsible for maintaining and calculating the performance of the AGA Index, a market capitalization weighted index of the common stocks of the approximately 70 corporate members of the AGA, which serves as the benchmark for the AGA Gas Index Fund.

As an Assistant Vice President from 1994 - 1996, I prepared fair rate of return and cost of capital exhibits which were filed along with expert testimony before various state and federal public utility regulatory bodies. These supporting exhibits include the determination of an appropriate ratemaking capital structure and the development of embedded cost rates of senior capital. The exhibits also support the determination of a recommended return on common equity through the use of various market models, such as, but not limited to, Discounted Cash Flow analysis, Capital Asset Pricing Model and Risk Premium Methodology, as well as an assessment of the risk characteristics of the client utility. I also assisted in the preparation of responses to any interrogatories received regarding such testimonies filed on behalf of client utilities. Following the filing of fair rate of return testimonies, I assisted in the evaluation of opposition testimony in order to prepare interrogatory questions, areas of cross-examination, and rebuttal testimony. I also evaluated and assisted in the preparation of briefs and exceptions following the hearing process. I also submitted testimony before state public utility commissions regarding appropriate capital structure ratios and fixed capital cost rates.

1990-1994

As a Senior Financial Analyst, I supervised two analysts and assisted in the preparation of fair rate of return and cost of capital exhibits which are filed along with expert testimony before various state and federal public utility regulatory bodies. The team also assisted in the preparation of interrogatory responses.

I evaluated the final orders and decisions of various commissions to determine whether further actions were warranted and to gain insight which assisted in the preparation of future rate of return studies.

I assisted in the preparation of an article authored by Frank J. Hanley and A. Gerald Harris entitled "Does Diversification Increase the Cost of Equity Capital?" published in the July 15, 1991 issue of Public Utilities Fortnightly.

In 1992, I was awarded the professional designation "Certified Rate of Return Analyst" (CRRA) by the National Society of Rate of Return Analysts (now the Society of Utility and Regulatory Financial Analysts (SURFA)). This designation is based upon education, experience and the successful completion of a comprehensive examination.

As Administrator of Financial Analysis for AUS Utility Reports, which then reported financial data for over 200 utility companies with approximately 1,000 subscribers, I oversaw the preparation of this monthly publication, as well as the accompanying annual publication, Financial Statistics - Public Utilities.

1988-1990

As a Financial Analyst, I assisted in the preparation of fair rate of return studies including capital structure determination, development of senior capital cost rates, as well as the determination of an appropriate rate of return on equity. I also assisted in the preparation of interrogatory responses, interrogatory questions of the opposition, areas of cross-examination and rebuttal testimony. I also assisted in the preparation of the annual publication C. A. Turner Utility Reports - Financial Statistics -Public Utilities.

1973-1975

As a Research Assistant in the Research Department of the Regional Economics Division of the Federal Reserve Bank of Boston, I was involved in the development and maintenance of econometric models to simulate regional economic conditions in New England in order to study the effects of, among other things, the energy crisis of the early 1970's and property tax revaluations on the economy of New England. I was also involved in the statistical analysis and preparation of articles for the New England Economic Review. Also, I was Assistant Editor of New England Business Indicators.

1972

As a Research Assistant in the Office of the Assistant Secretary for International Affairs, U.S. Treasury Department, Washington, D.C., I developed and maintained econometric models which simulated the economy of the United States in order to study the results of various

alternate foreign trade policies so that national trade policy could be formulated and recommended.

Clients Served

I have offered expert testimony before the following commissions:

Arkansas
California
Connecticut
Delaware
Florida
Hawaii
Idaho
Illinois
Indiana
Iowa
Kentucky
Louisiana
Maine
Maryland
Michigan
Missouri
Nevada
New Jersey
New York
North Carolina
Ohio
Pennsylvania
Rhode Island
South Carolina
Virginia
Washington

I have sponsored testimony on generic/uniform methodologies for determining the return on common equity for:

Aquarion Water Company
The Connecticut Water Company
United Water Connecticut, Inc.
Utilities, Inc.

I have sponsored testimony on the rate of return and capital structure effects of merger and acquisition issues for:

California-American Water Company
New Jersey-American Water Company

I have sponsored testimony on fair rate of return and related issues for:

Alpena Power Company
Apple Canyon Utility Company
Applied Wastewater Management, Inc.
Aqua Illinois, Inc.
Aqua New Jersey, Inc.
Aqua North Carolina, Inc.
Aqua Virginia, Inc.
Aquarion Water Company
Artesian Water Company
The Atlantic City Sewerage Company
Audubon Water Company
The Borough of Hanover, PA
Carolina Pines Utilities, Inc.
Carolina Water Service, Inc. of NC
Carolina Water Service, Inc. of SC
The Columbia Water Company
The Connecticut Water Company
Consumers Illinois Water Company
Consumers Maine Water Company
Consumers New Jersey Water Company
City of DuBois, Pennsylvania
Elizabethtown Water Company
Emporium Water Company
GTE Hawaiian Telephone Inc.
Greenridge Utilities, Inc.
Illinois American Water Company
Iowa American Water Company
Water Services Corp. of Kentucky
Lake Wildwood Utilities Corp.
Land'Or Utility Company

Long Island American Water Company
Long Neck Water Company
Louisiana Water Service, Inc.
Massanutten Public Service Company
Middlesex Water Company
Missouri-American Water Company
Mt. Holly Water Company
Nero Utility Services, Inc.
New Jersey-American Water Company
The Newtown Artesian Water Company
NRG Energy Center Pittsburgh LLC
NRG Energy Center Harrisburg LLC
Ohio-American Water Company
Penn Estates Utilities
Pinelands Water Company
Pinelands Waste Water Company
Pittsburgh Thermal
San Jose Water Company
Southland Utilities, Inc.
Spring Creek Utilities, Inc.
Sussex Shores Water Company
Tega Cay Water Service, Inc.
Total Environmental Services, Inc. –
Treasure Lake Water & Sewer Divisions
Thames Water Americas
Tidewater Utilities, Inc.
Transylvania Utilities, Inc.
Trigen – Philadelphia Energy Corporation
Twin Lakes Utilities, Inc.
United Utility Companies
United Water Arkansas, Inc.
United Water Arlington Hills Sewerage, Inc.
United Water Connecticut, Inc.
United Water Delaware, Inc.
United Water Great Gorge Inc. / United Water Vernon Transmission, Inc.
United Water Idaho, Inc.
United Water Indiana, Inc.
United Water New Jersey, Inc.
United Water New Rochelle, Inc.
United Water New York, Inc.
United Water Owego / Nichols, Inc.
United Water Pennsylvania, Inc.
United Water Rhode Island, Inc.
United Water South County, Inc.
United Water Toms River, Inc.
United Water Vernon Sewage Inc.
United Water Virginia, Inc.
United Water Westchester, Inc.
United Water West Lafayette, Inc.
United Water West Milford, Inc.
Utilities, Inc.
Utilities Inc. of Central Nevada
Utilities, Inc. of Florida
Utilities, Inc. of Louisiana
Utilities, Inc. of Nevada
Utilities, Inc. of Pennsylvania
Utilities, Inc. - Westgate
Utilities Services of South Carolina
Utility Center, Inc.
Valley Energy, Inc.
Wellsboro Electric Company
Western Utilities, Inc.

I have sponsored testimony on capital structure and senior capital cost rates for the following clients:

Alpena Power Company
Arkansas-Western Gas Company
Associated Natural Gas Company
PG Energy Inc.
United Water Delaware, Inc.
Washington Natural Gas Company

I have assisted in the preparation of rate of return studies on behalf of the following clients:

Algonquin Gas Transmission Company
Anadarko Petroleum Corporation
Arkansas-Louisiana Gas Company
Arkansas Western Gas Company
Artesian Water Company
Associated Natural Gas Company
Atlantic City Electric Company
Bridgeport-Hydraulic Company
Cambridge Electric Light Company
Carolina Power & Light Company
Citizens Gas and Coke Utility
City of Vernon, CA
Columbia Gas/Gulf Transmission Cos.
Commonwealth Electric Company
Commonwealth Telephone Company
Conestoga Telephone & Telegraph Co.
Connecticut Natural Gas Corporation
Consolidated Gas Transmission Company
Consumers Power Company
CWS Systems, Inc.
Delmarva Power & Light Company
East Honolulu Community Services, Inc.
Equitable Gas Company
Equitrans, Inc.
Florida Power & Light Company
Gary Hobart Water Company
Gasco, Inc.
GTE Arkansas, Inc.
GTE California, Inc.
GTE Florida, Inc.
GTE Hawaiian Telephone
GTE North, Inc.
GTE Northwest, Inc.
GTE Southwest, Inc.
Great Lakes Gas Transmission L.P.
Hawaiian Electric Company
Hawaiian Electric Light Company
IES Utilities Inc.
Illinois Power Company
Interstate Power Company
Interstate Power & Light Co.
Iowa Electric Light and Power Company
Iowa Southern Utilities Company
Kentucky-West Virginia Gas Company
Lockhart Power Company
Middlesex Water Company
Milwaukee Metropolitan Sewer District
Mountaineer Gas Company
National Fuel Gas Distribution Corp.
National Fuel Gas Supply Corp.
Newco Waste Systems of NJ, Inc.
New Jersey Natural Gas Company
New Jersey-American Water Company
New York-American Water Company
North Carolina Natural Gas Corp.
Northumbrian Water Company
Ohio-American Water Company
Oklahoma Natural Gas Company
Orange and Rockland Utilities
Paiute Pipeline Company
PECO Energy Company
Penn Estates Utilities, Inc.
Penn-York Energy Corporation
Pennsylvania-American Water Co.
PG Energy Inc.
Philadelphia Electric Company
Providence Gas Company
South Carolina Pipeline Company
Southwest Gas Corporation
Stamford Water Company
Tesoro Alaska Petroleum Company
Tesoro Refining & Marketing Co.
United Telephone of New Jersey
United Utility Companies
United Water Arkansas, Inc.
United Water Delaware, Inc.

(Rate of Return Study Clients Continued)

United Water Idaho, Inc.
United Water Indiana, Inc.
United Water New Jersey, Inc.
United Water New York, Inc.
United Water Pennsylvania, Inc.
United Water Virginia, Inc.
United Water West Lafayette, Inc.
Utilities, Inc. of Pennsylvania
Utilities, Inc. - Westgate
Vista-United Telecommunications Corp.
Washington Gas Light Company
Washington Natural Gas Company
Washington Water Power Corporation
Waste Management of New Jersey – Transfer Station A
Wellsboro Electric Company
Western Reserve Telephone Company
Western Utilities, Inc.
Wisconsin Power and Light Company

EDUCATION:

1973 – Clark University – B.A. – Honors in Economics (Concentration: Econometrics and Regional/International Economics)
1991 – Rutgers University – M.B.A. – High Honors (Concentration: Corporate Finance)

PROFESSIONAL AFFILIATIONS:

American Finance Association
Financial Management Association
Society of Utility and Regulatory Financial Analysts
Member, Board of Directors – 2010-2012
President – 2006-2008 and 2008-2010
Secretary/Treasurer – 2004-2006
Energy Association of Pennsylvania
National Association of Water Companies – Member of the Finance/Accounting/Taxation Committee

SPEAKING ENGAGEMENTS:

"Public Utility Betas and the Cost of Capital", (co-presenter with Richard A. Michelfelder, Ph.D.) – Advanced Workshop in Regulation and Competition, 30th Annual Eastern Conference of the Center for Research in Regulated Industries (CRRI), May 20, 2011, Rutgers University, Skytop, PA.

"A New Approach for Estimating the Equity Risk Premium for Public Utilities", (co-presenter with Richard A. Michelfelder, Ph.D.) – Hot Topic Hotline Webinar, December 3, 2010, Financial Research Institute of the University of Missouri.

"A New Approach for Estimating the Equity Risk Premium for Public Utilities", (co-presenter with Richard A. Michelfelder, Ph.D.) before the Indiana Utility Regulatory Commission Cost of Capital Task Force, September 28, 2010, Indianapolis, IN

Tomorrow's Cost of Capital: Cost of Capital Issues 2010, Deloitte Center for Energy Solutions, 2010 Deloitte Energy Conference, "Changing the Great Game: Climate, Customers and Capital", June 7-8, 2010, Washington, DC.

"Cost of Capital Issues – 2010" – Deloitte Center for Energy Solutions 2010 Energy Conference: Changing the Great Game: Climate, Consumers and Capital, June 7-8, 2010, Washington, DC

"A New Approach for Estimating the Equity Risk Premium for Public Utilities", (co-presenter with Richard A. Michelfelder, Ph.D.) – Advanced Workshop in Regulation and Competition, 29th Annual Eastern Conference of the Center for Research in Regulated Industries (CRRI), May 20, 2010, Rutgers University, Skytop, PA

Moderator: Society of Utility and Regulatory Financial Analysts: 42nd Financial Forum – "The Changing Economic and Capital Market Environment and the Utility Industry", April 29-30, 2010, Washington, DC

"A New Model for Estimating the Equity Risk Premium for Public Utilities" (co-presenter with Richard A. Michelfelder, Ph.D.) – Spring 2010 Meeting of the Staff Subcommittee on Accounting and Finance of the National Association of Regulatory Utility Commissioners, March 17, 2010, Charleston, SC

"New Approach to Estimating the Cost of Common Equity Capital for Public Utilities" (co-presenter with Richard A. Michelfelder, Ph.D.) - Advanced Workshop in Regulation and Competition, 28th Annual Eastern Conference of the Center for Research in Regulated Industries (CRRI), May 14, 2009, Rutgers University, Skytop, PA

Moderator: Society of Utility and Regulatory Financial Analysts: 41st Financial Forum – "Estimating the
Cost of Capital in Today's Economic and Capital Market Environment", April 16-17, 2009, Washington, DC

"Water Utility Financing: Where Does All That Cash Come From?", AWWA Pre-Conference Workshop: Water Utility Ratemaking, March 25, 2008, Atlantic City, NJ

PAPERS:

"Public Utility Beta Adjustment and the Cost of Capital", co-authored with Richard A. Michelfelder, Ph.D. and Panayiotis Theodossiou, Ph.D. (under review at Journal of Applied Corporate Finance).

"A New Approach for Estimating the Equity Risk Premium for Public Utilities", co-authored with Frank J. Hanley and Richard A. Michelfelder, Ph.D. (forthcoming in The Journal of Regulatory Economics).

"Comparable Earnings: New Life for an Old Precept" co-authored with Frank J. Hanley, Financial Quarterly Review, (American Gas Association), Summer 1994.

EXHIBIT 1

Bermuda Water Company
Docket No. W-01812A-10-0521

BEFORE THE

ARIZONA CORPORATION COMMISSION

EXHIBIT

TO ACCOMPANY THE

REBUTTAL TESTIMONY

OF

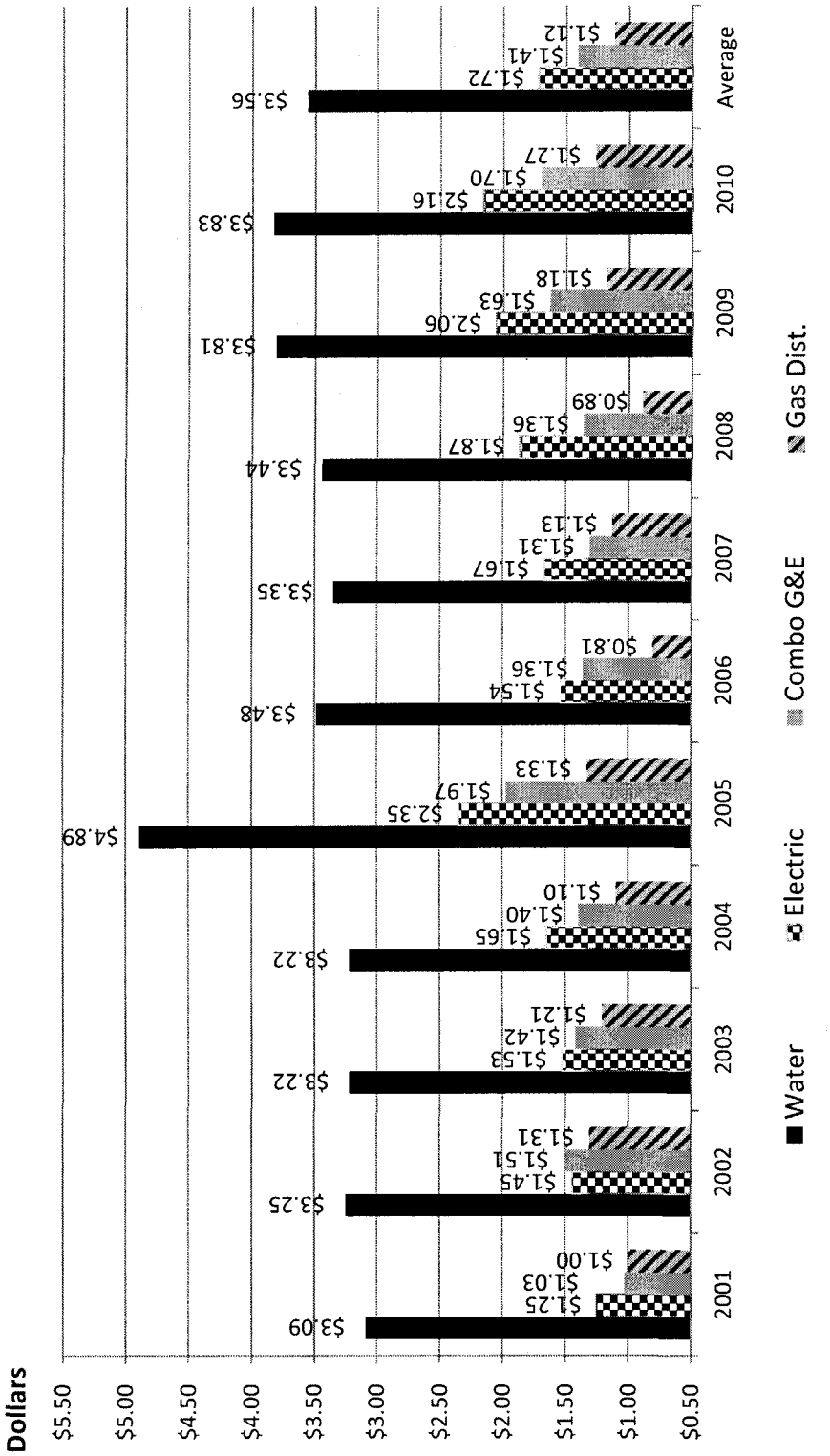
PAULINE M. AHERN, CRRA
PRINCIPAL
AUS CONSULTANTS

ON BEHALF OF

BERMUDA WATER COMPANY

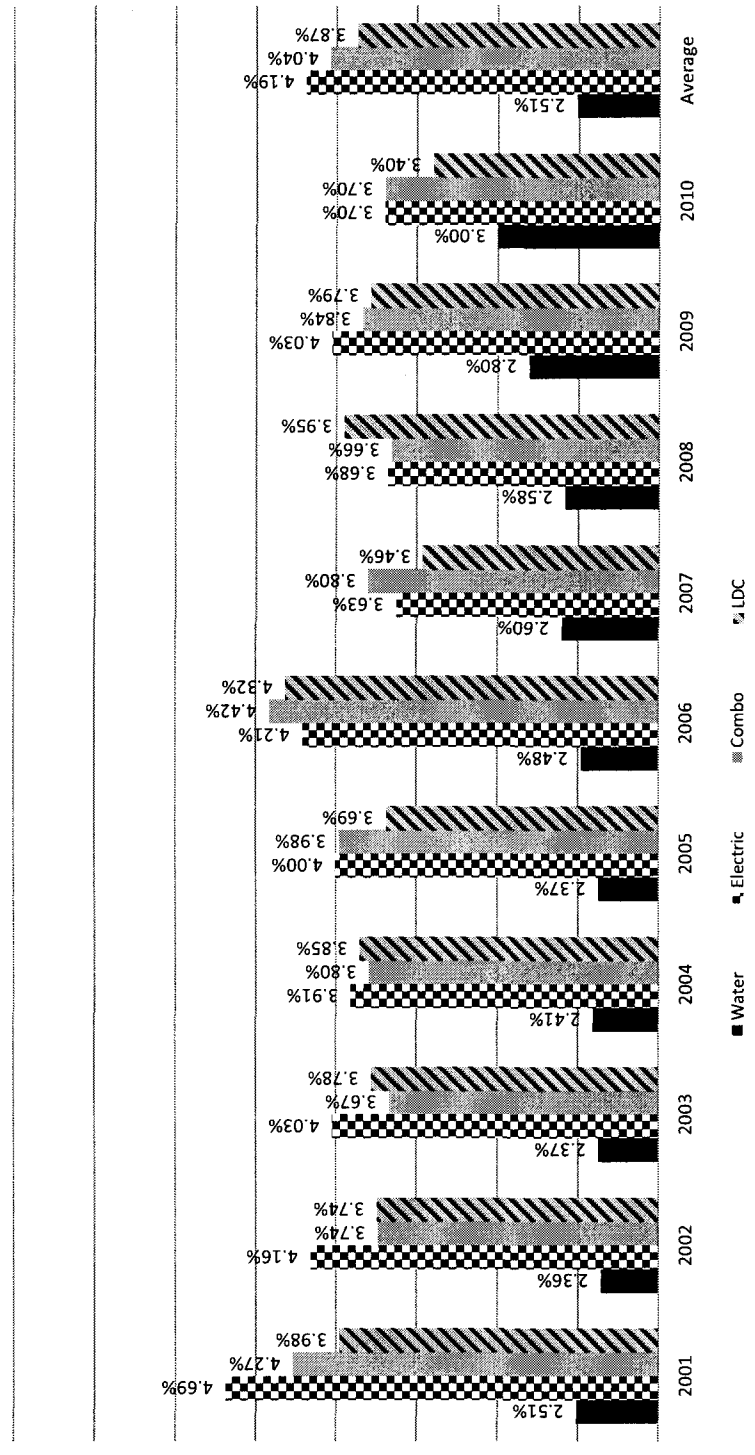
SEPTEMBER 2011

Capital Intensity of the AUS Utility Reports Companies
2001 - 2010



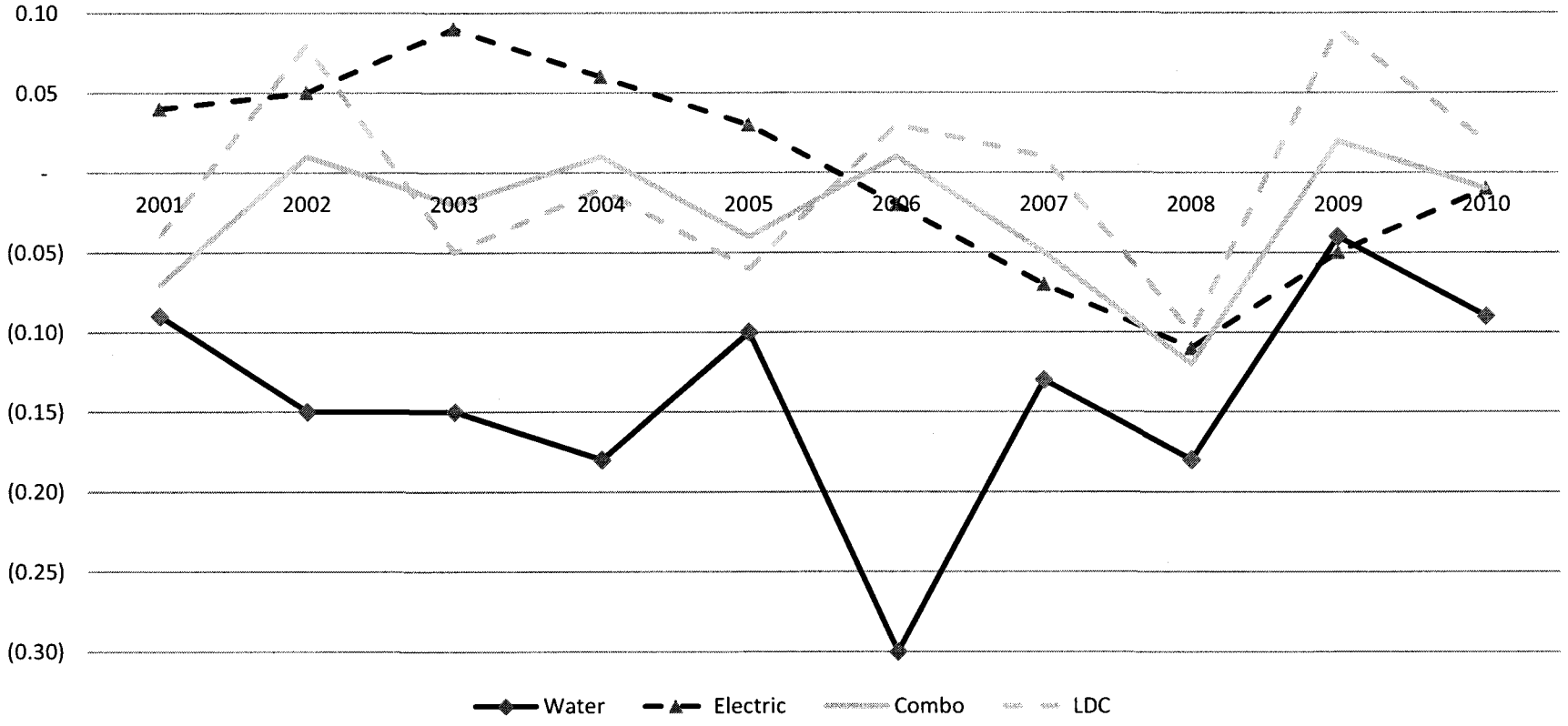
Source of Information: SEC Edgar I-Metrix Online Database

Depreciation Rates for the AUS Utility Reports Companies 2001-2010



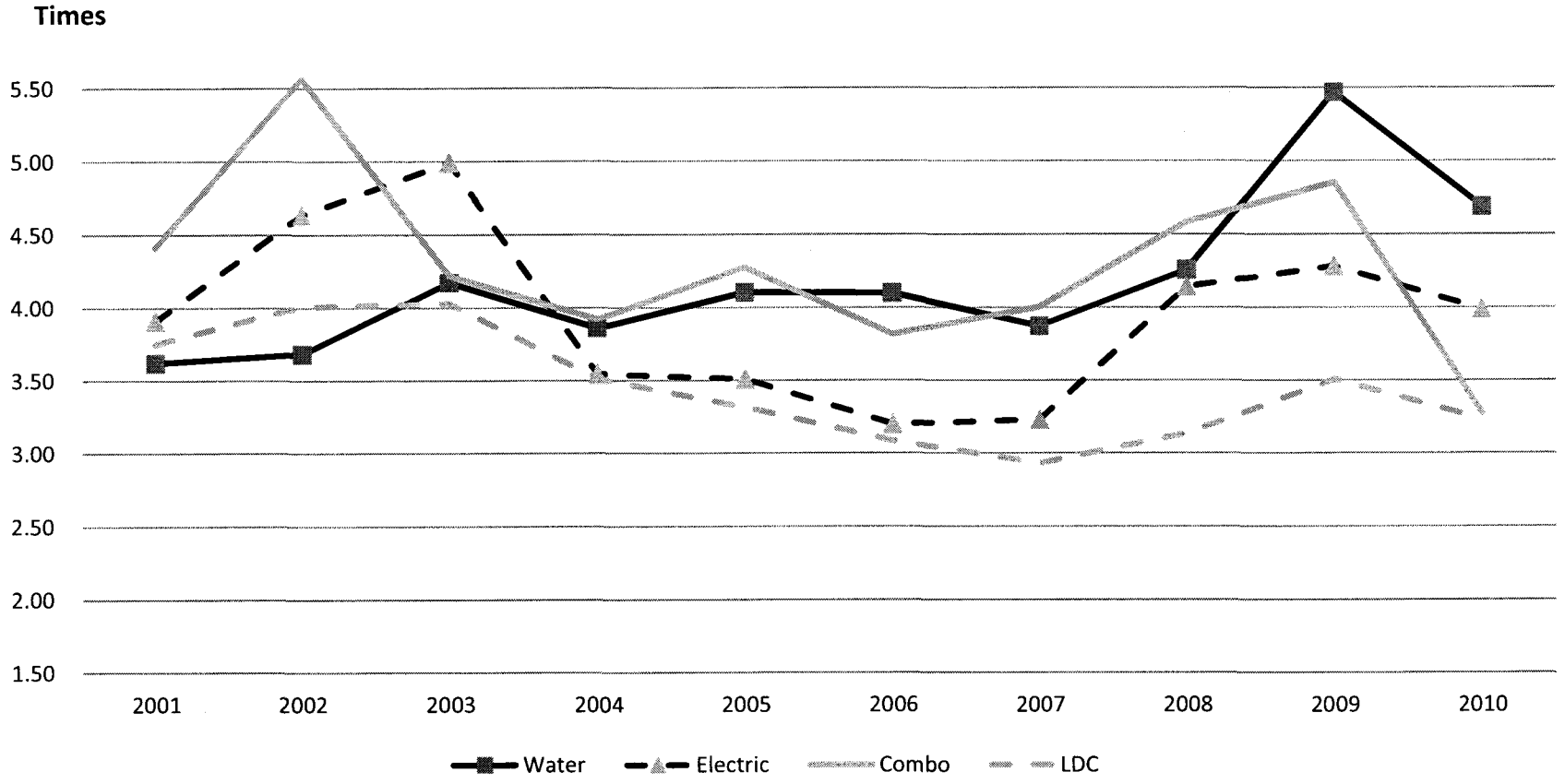
Source of Information: SEC Edgar I-Metrix Online Database

Free Cash Flow / Operating Revenues for the AUS Utility Reports Companies 2001 - 2010



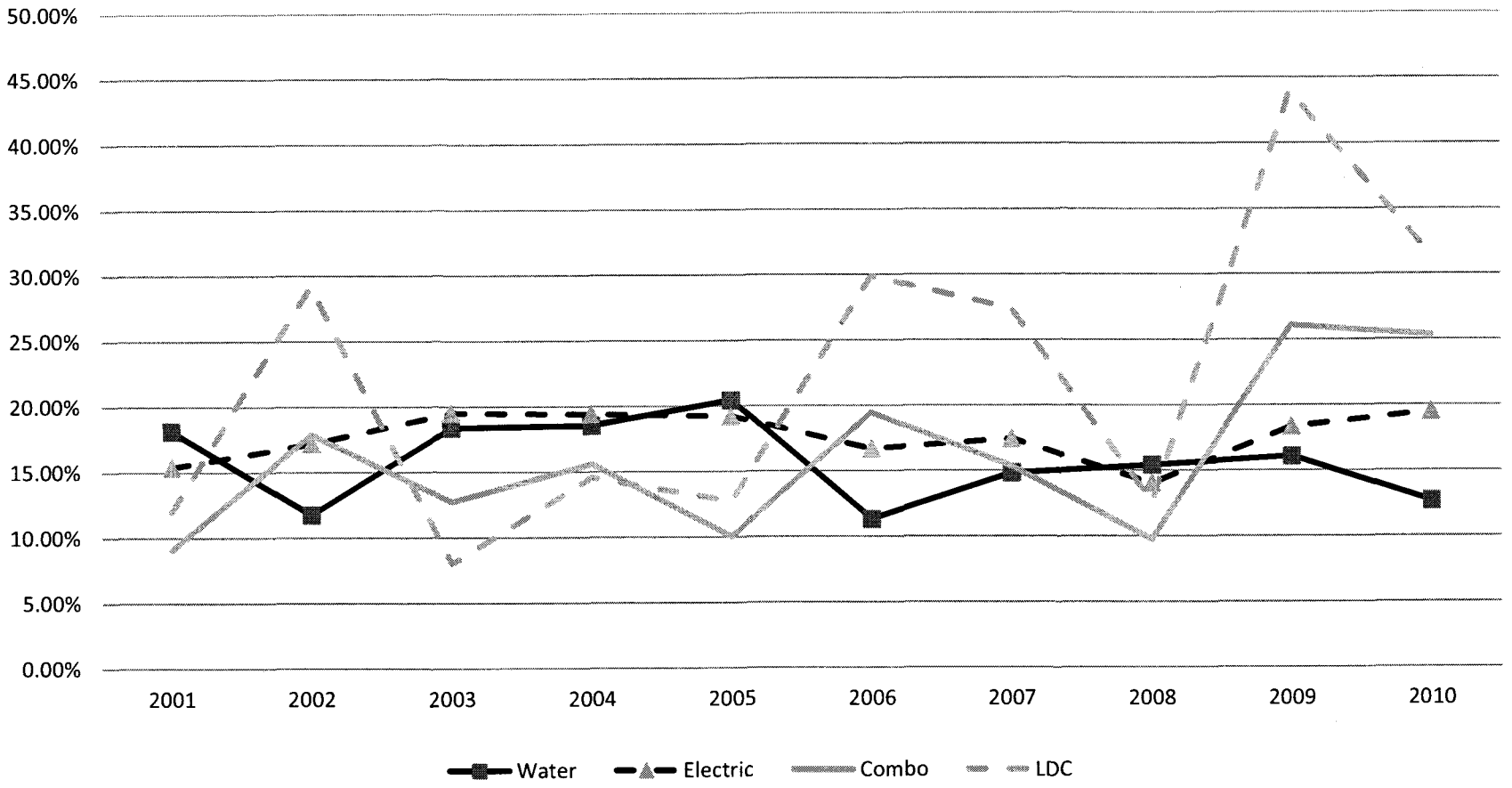
Source of Information: SEC Edgar I-Metrix Online Database

Total Debt / EBITDA for the AUS Utility Reports Companies
2001 - 2010



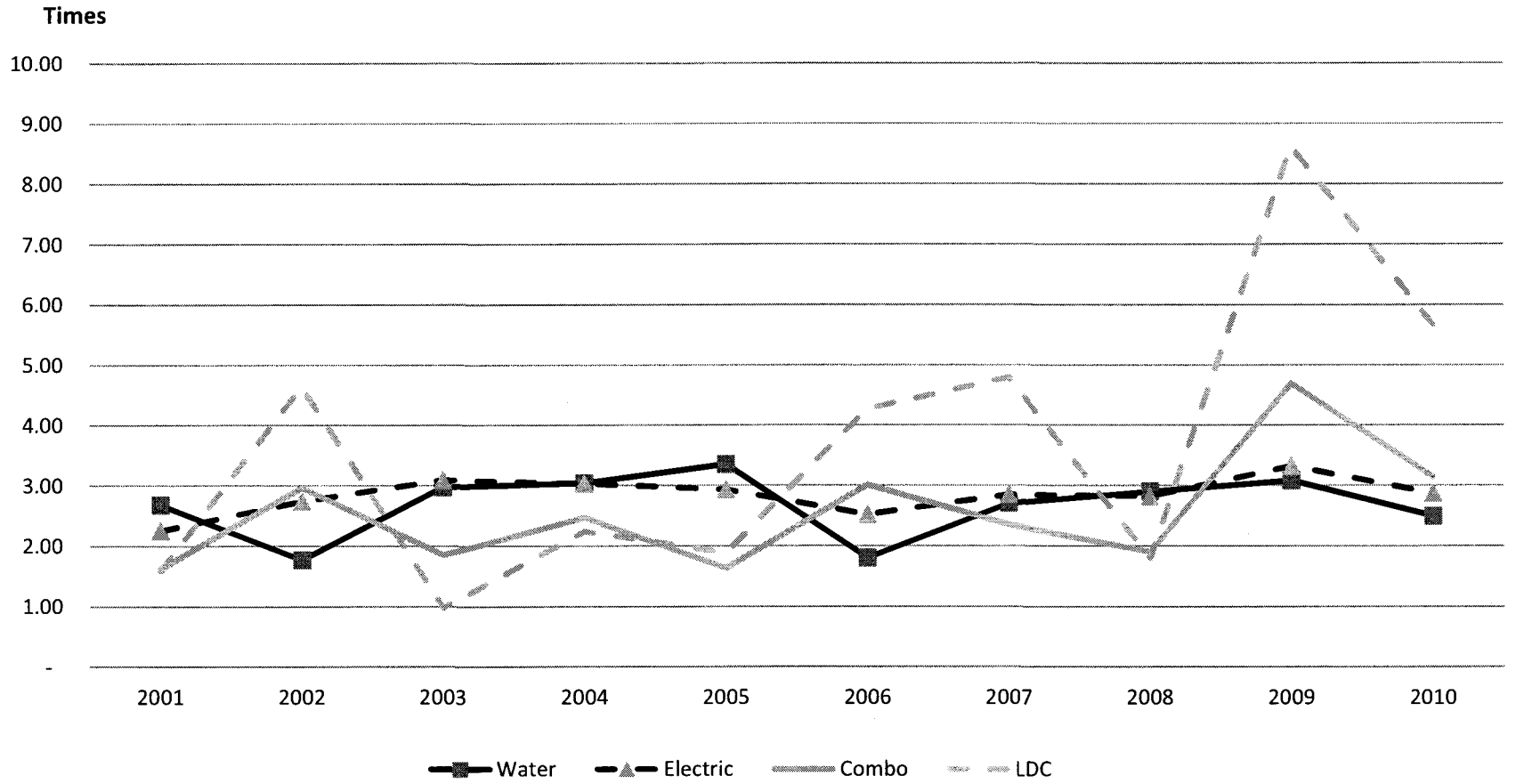
Source of Information: SEC Edgar I-Metrix Online Database

Funds From Ops / Total Debt for the AUS Utility Reports Cos.
2001- 2010



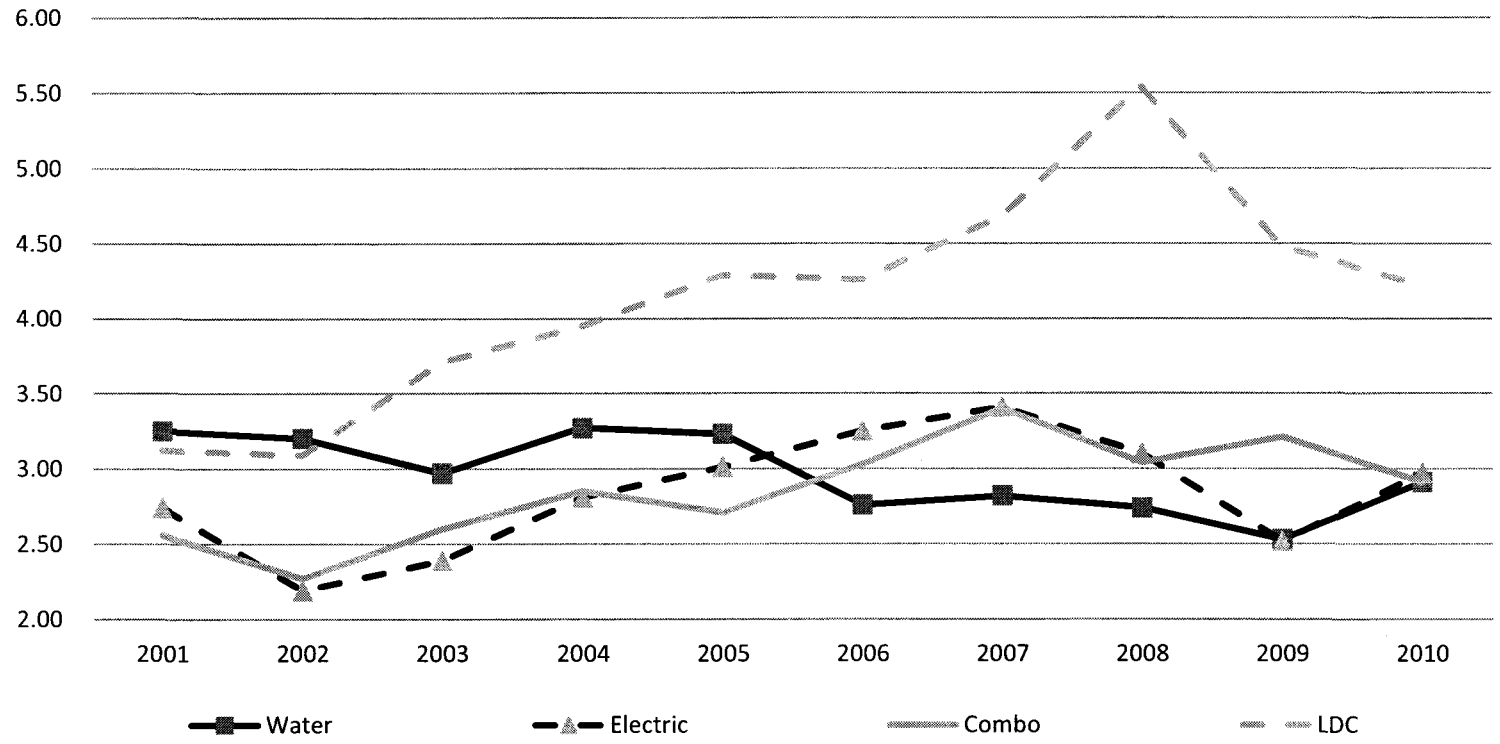
Source of Information: SEC Edgar I-Metrix Online Database

Funds From Ops / Interest Cov. for the AUS Utility Reports Cos.
2001 - 2010



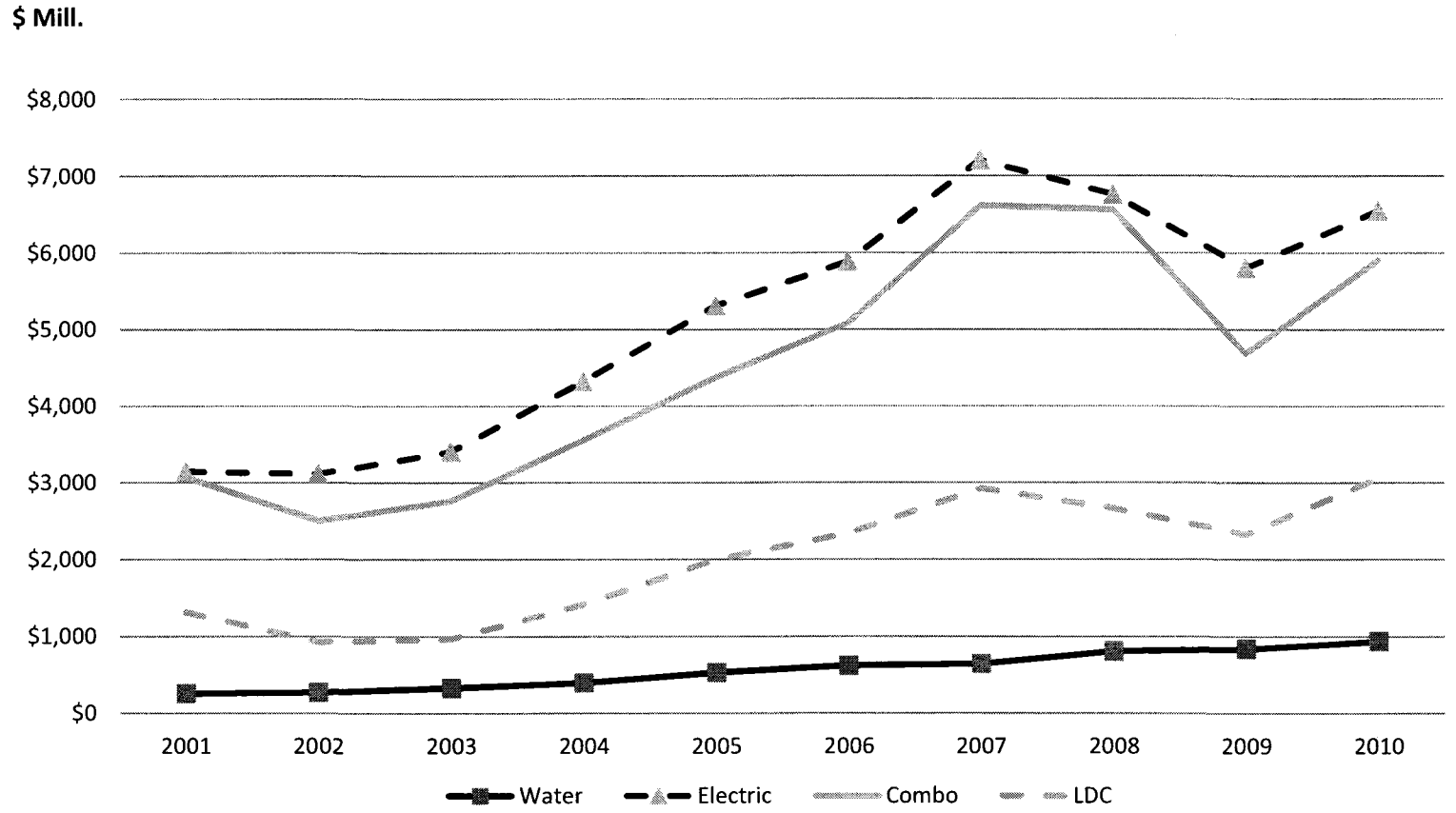
Source of Information: SEC Edgar I-Metrix Online Database

Before-Inc. Tax / Interest Cov. for the AUS Utility Reports Cos.
2001 - 2010



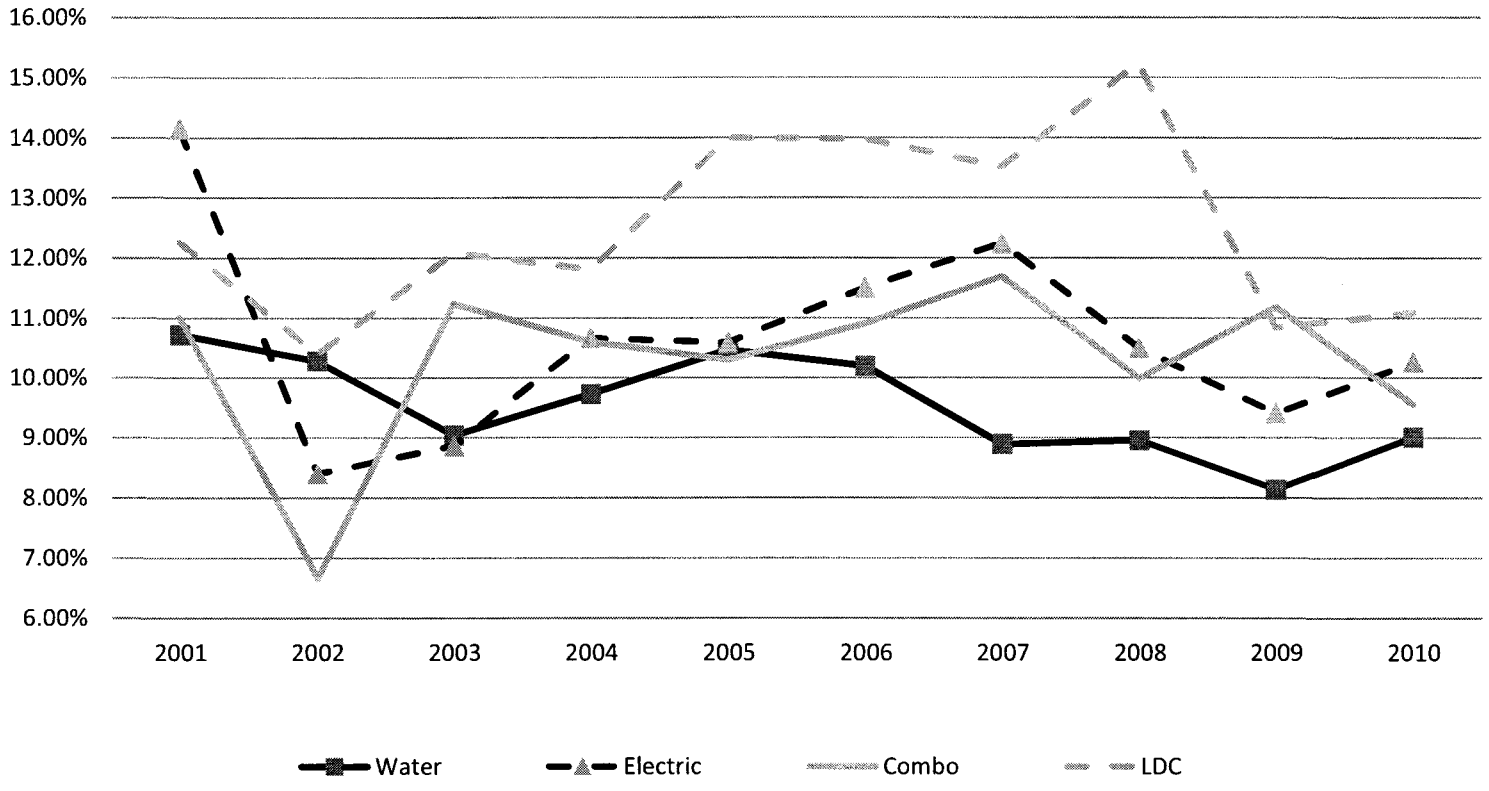
Source of Information: SEC Edgar I-Metrix Online Databae

Market Capitalization for the AUS Utility Reports Companies
2001 - 2010



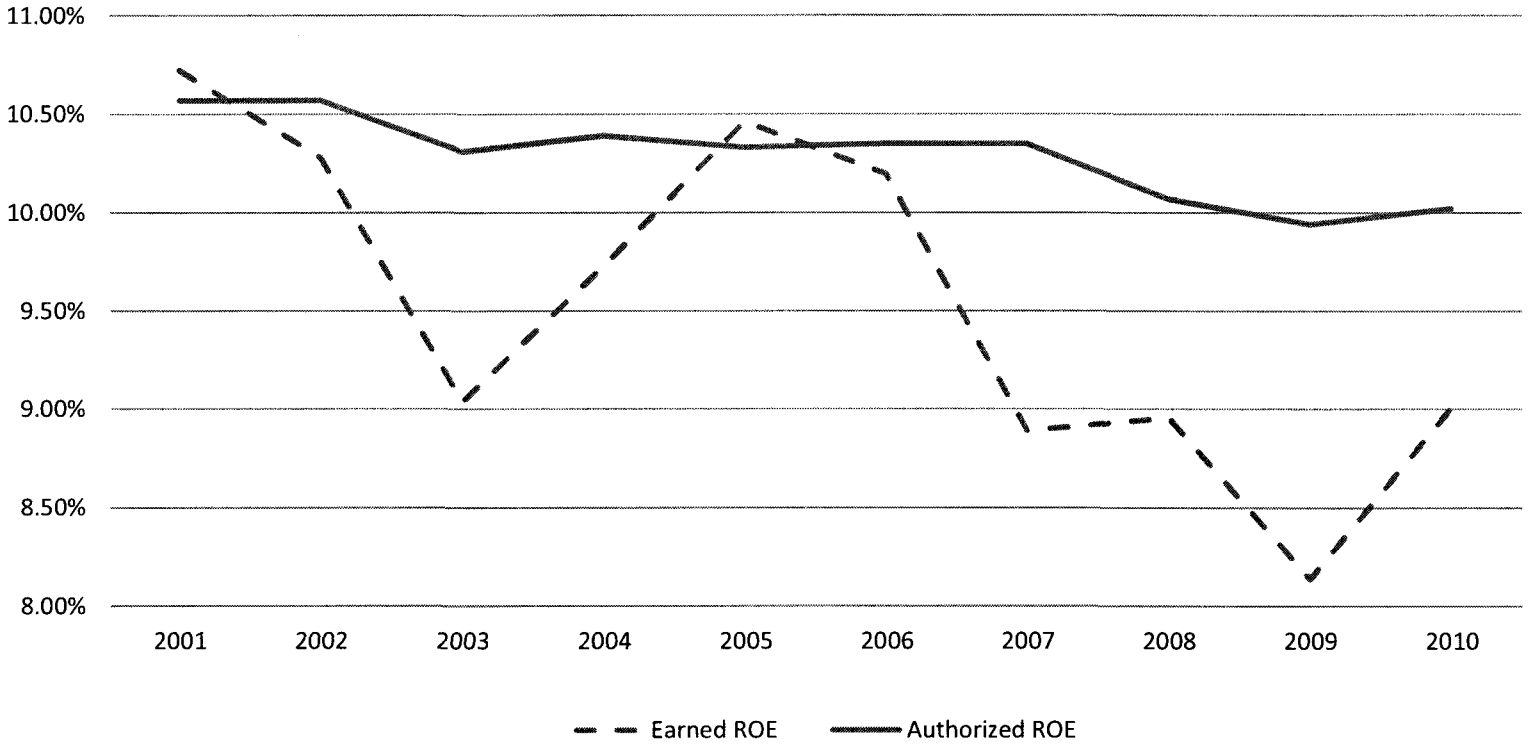
Source of Information: SEC Edgar I-Metrix Online Database

Earned Returns on Common Equity for the AUS Utility Reports Cos.
2001 - 2010



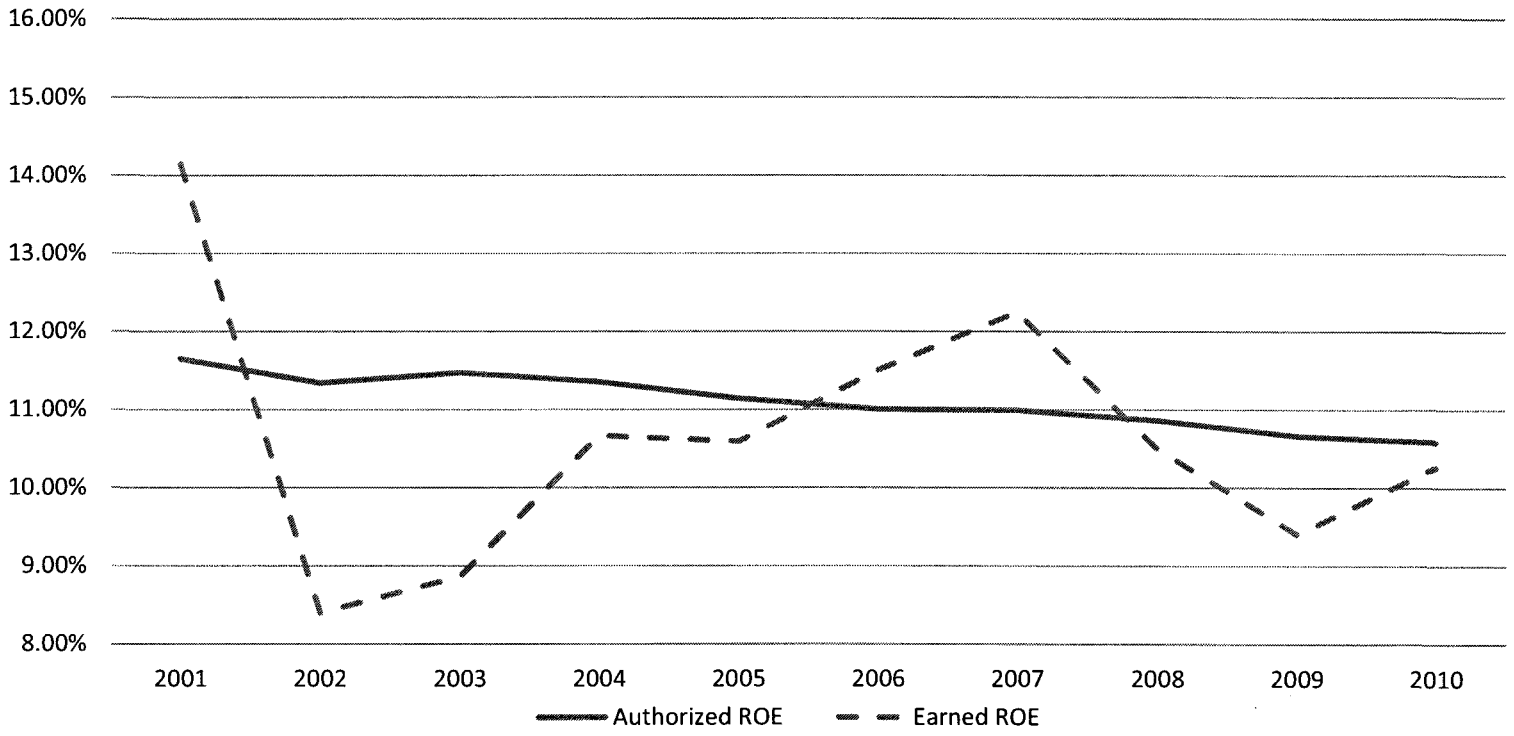
Source of Information: SEC Edgar I-Metrix Online Database

Earned ROE v Authorized ROE for the AUS Utility Reports Water Companies
2001 - 2010



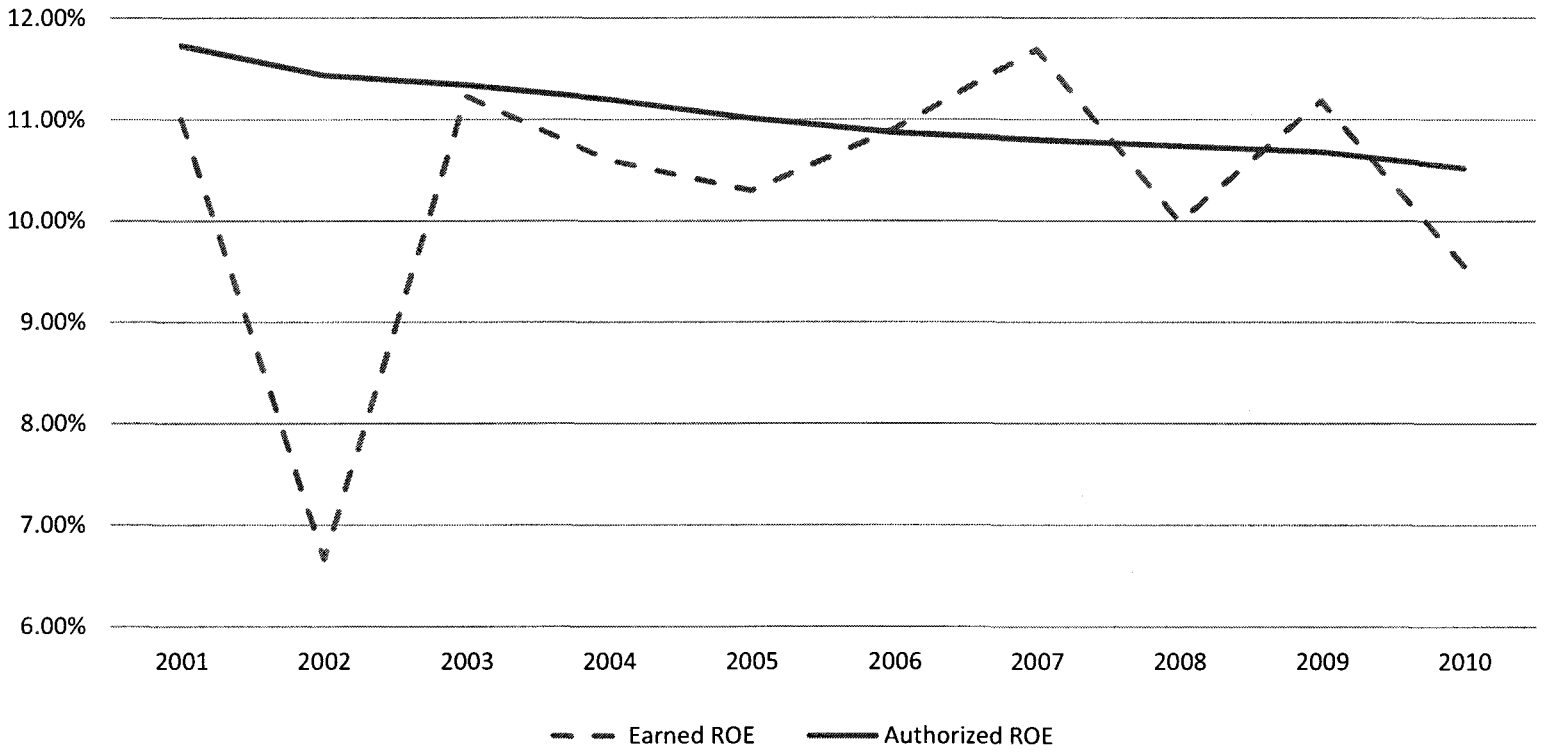
Source of Information: SEC Edgar I-Metrix Online Database & AUS Utility Reports

Earned ROE v Authorized ROE for the AUS Utility Reports Electric Companies
2001 - 2010



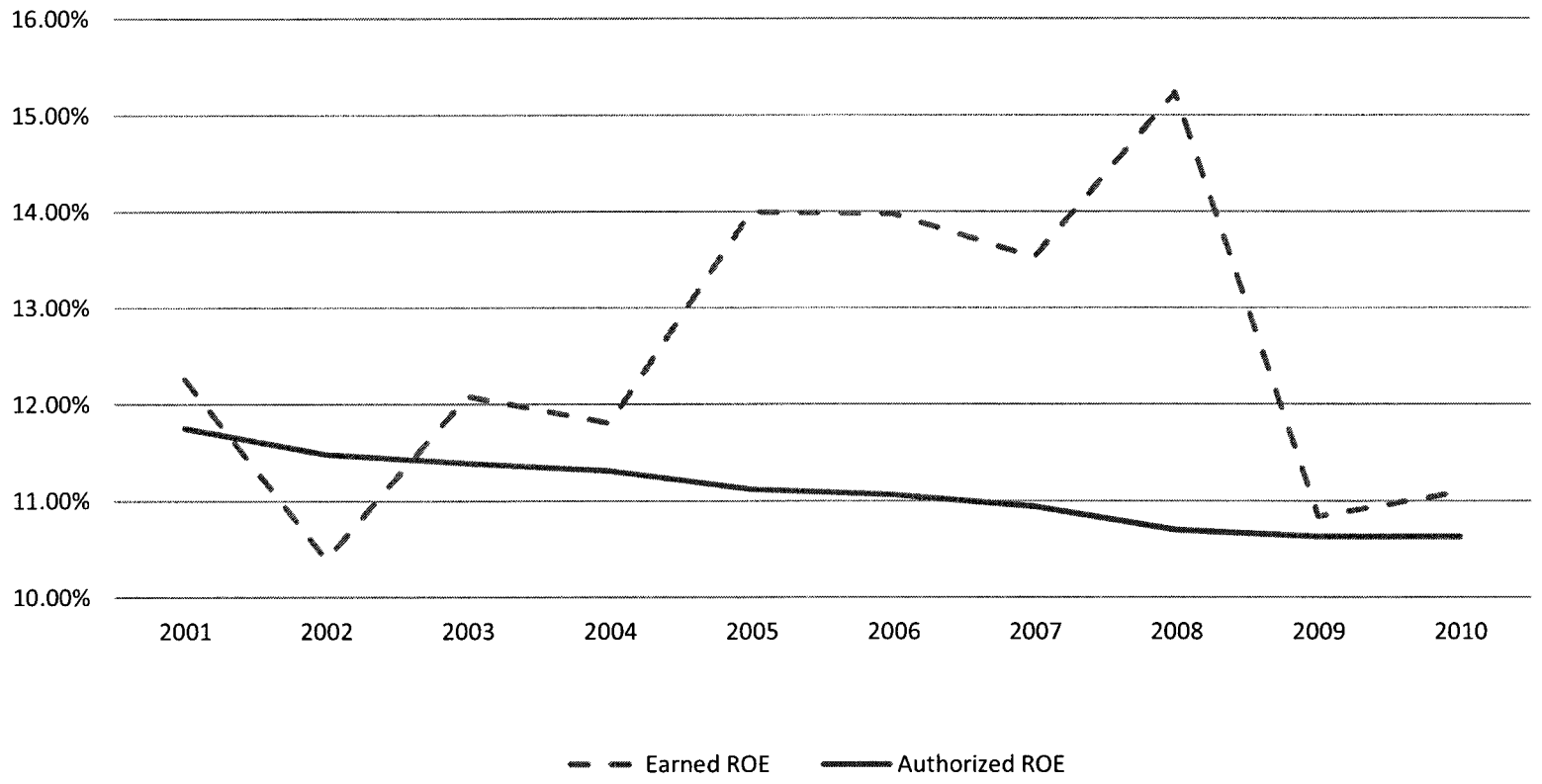
Source of Information: SEC Edgar I-Metrix Online Database & AUS Utility Reports

Earned ROE v Authorized ROE for the AUS Utility Reports Combination Companies
2001 - 2010



Source of Information: SEC Edgar I-Metrix Online Database & AUS Utility Reports

Earned ROE v Authorized ROE for the AUS Utility Reports LDC Companies
2001 - 2010



Source of Information: SEC Edgar I-Metrix Online Database & AUS Utility Reports

Exhibit No. ___
Schedule PMA-2
Page 1 of 1

Bermuda Water Company
Market-to-Book Ratios, Earnings / Book Ratios and
Inflation for Standard & Poor's Industrial Index and
the Standard & Poor's 500 Composite Index
from 1947 through 2010

Year	Market-to-Book Ratio (1)		Earnings/ Book Ratio (2)				
	S&P Industrial Index (3)	S&P 500 Composite Index (3)	S&P Industrial Index (3)	S&P 500 Composite Index (3)	Inflation (4)	Earnings / Book Ratio - Net of Inflation	
1947	1.23	NA	13.0 %	NA	9.0 %	4.0 %	NA
1948	1.13	NA	17.3	NA	2.7	14.6	NA
1949	1.00	NA	16.3	NA	(1.8)	18.1	NA
1950	1.16	NA	18.3	NA	5.8	12.5	NA
1951	1.27	NA	14.4	NA	5.9	8.5	NA
1952	1.29	NA	12.7	NA	0.9	11.8	NA
1953	1.21	NA	12.7	NA	0.6	12.1	NA
1954	1.45	NA	13.5	NA	(0.5)	14.0	NA
1955	1.81	NA	16.0	NA	0.4	15.6	NA
1956	1.92	NA	13.7	NA	2.9	10.8	NA
1957	1.71	NA	12.5	NA	3.0	9.5	NA
1958	1.70	NA	9.8	NA	1.8	8.0	NA
1959	1.94	NA	11.2	NA	1.5	9.7	NA
1960	1.82	NA	10.3	NA	1.5	8.8	NA
1961	2.01	NA	9.8	NA	0.7	9.1	NA
1962	1.83	NA	10.9	NA	1.2	9.7	NA
1963	1.94	NA	11.4	NA	1.7	9.7	NA
1964	2.18	NA	12.3	NA	1.2	11.1	NA
1965	2.21	NA	13.2	NA	1.9	11.3	NA
1966	2.00	NA	13.2	NA	3.4	9.8	NA
1967	2.05	NA	12.1	NA	3.0	9.1	NA
1968	2.17	NA	12.6	NA	4.7	7.9	NA
1969	2.10	NA	12.1	NA	6.1	6.0	NA
1970	1.71	NA	10.4	NA	5.5	4.9	NA
1971	1.99	NA	11.2	NA	3.4	7.8	NA
1972	2.16	NA	12.0	NA	3.4	8.6	NA
1973	1.96	NA	14.6	NA	8.8	5.8	NA
1974	1.39	NA	14.8	NA	12.2	2.6	NA
1975	1.34	NA	12.3	NA	7.0	5.3	NA
1976	1.51	NA	14.5	NA	4.8	9.7	NA
1977	1.38	NA	14.6	NA	6.8	7.8	NA
1978	1.25	NA	15.3	NA	9.0	6.3	NA
1979	1.23	NA	17.2	NA	13.3	3.9	NA
1980	1.31	NA	15.6	NA	12.4	3.2	NA
1981	1.24	NA	14.9	NA	8.9	6.0	NA
1982	1.17	NA	11.3	NA	3.9	7.4	NA
1983	1.45	NA	12.2	NA	3.8	8.4	NA
1984	1.46	NA	14.6	NA	4.0	10.6	NA
1985	1.67	NA	12.2	NA	3.8	8.4	NA
1986	2.02	NA	11.5	NA	1.1	10.4	NA
1987	2.50	NA	15.7	NA	4.4	11.3	NA
1988	2.13	NA	19.0	NA	4.4	14.6	NA
1989	2.56	NA	18.5	NA	4.7	13.8	NA
1990	2.63	NA	16.3	NA	6.1	10.2	NA
1991	2.77	NA	10.8	NA	3.1	7.7	NA
1992	3.29	NA	13.0	NA	2.9	10.1	NA
1993	3.72	NA	15.7	NA	2.8	12.9	NA
1994	3.73	NA	23.0	NA	2.7	20.3	NA
1995	4.06	2.64	22.9	16.0 %	2.5	20.4	13.5 %
1996	4.79	3.00	24.8	16.8	3.3	21.5	13.5
1997	5.88	3.53	24.6	16.3	1.7	22.9	14.6
1998	7.13	4.16	21.3	14.5	1.6	19.7	12.9
1999	8.27	4.76	25.2	17.1	2.7	22.5	14.4
2000	7.51	4.51	23.9	16.2	3.4	20.5	12.8
2001	NA	3.50	NA	7.4	1.6	NA	5.8
2002	NA	2.93	NA	8.3	2.4	NA	5.9
2003	NA	2.78	NA	14.1	1.9	NA	12.2
2004	NA	2.91	NA	15.3	3.3	NA	12.0
2005	NA	2.78	NA	16.4	3.4	NA	13.0
2006	NA	2.75 (5)	NA	17.2	2.5	NA	14.7
2007	NA	2.77 (5)	NA	12.8	4.1	NA	8.7
2008	NA	2.02 (5)	NA	2.7	0.1	NA	2.6
2009	NA	1.63 (5)	NA	9.2	2.7	NA	6.5
2010	NA	1.92 (5)	NA	13.0	1.5	NA	11.5
Average	2.34	3.04	14.9 %	13.3 %	3.7 %	10.9 %	10.9 %

Notes: (1) Market-to-Book Ratio equals average of the high and low market price for the year divided by the average book value.

(2) Earnings/Book equals earnings per share for the year divided by the average book value.

(3) On January 2, 2001 Standard & Poor's released Global Industry Classification Standard (GICS) price indexes for all Standard & Poor's U.S. indexes. As a result, all S&P Indexes have been calculated with a common base of 100 at a start date of December 31, 1994. Also, the GICS industrial sector is not comparable to the former S&P Industrial Index and data for the former S&P Industrial Index has been discontinued.

(4) As measured by the Consumer Price Index (CPI).

(5) Ratios for 2006 / 2007 are based upon estimated book values using the actual average price and the estimated book value calculated by adding the 2006 earnings per share to the 2005 / 2006 book value per share and then subtracting the 2006 / 2007 dividends per share as provided by Standard & Poor's Statistical Record - Current Statistics, March 2008, p. 29.

Source of Information: Standard & Poor's Security Price Index Record, 2000 Edition, p. 40
Standard & Poor's Statistical Service, Current Statistics, June 2011, p. 30
Standard & Poor's Compustat Services, Inc. PC Plus Research Insight Database
Ibbotson SBBI 2011 Valuation Yearbook

Bermuda Water Company
Example of the Inadequacy of
DCF Return Rate Related to Book Value
When Market Value Exceeds Book Value

Line No.		Based on RUCO Witness Rigsby's Proxy Group of Water Companies (a) Market Value	Based on RUCO Witness Rigsby's Proxy Group of Water Companies (b) Book Value
1.	Per Share	$ 24.403 (1)	$ 13.256 (2)
2.	DCF Cost Rate (3)	9.28%	9.28%
3.	Return in Dollars	$ 2.265	$ 1.230
4.	Dividends	$ 0.759 (4)	$ 0.759 (4)
5.	Growth in Dollars	$ 1.506	$ 0.471
6.	Return on Market Value (5)	9.28%	5.04%
7.	Rate of Growth on Market Value (6)	6.17%	1.93%

Notes:

(1) Average market price of RUCO Witness Rigsby's proxy group of water companies on lines 1 - 4 of Schedule WAR-3.

(2) Average book value from Schedule PMA-7, page 2 of this Exhibit.

(3) From Schedule WAR-2.

(4) Dividends per share based upon a 3.11% dividend yield. $0.776 = $24.403 * 3.11%.

(5) Line 3 / market value per share (line 1 column (a)).

(6) Line 6 - dividend yield from Schedule WAR-3.

Bermuda Water Company
Corrected Common Equity Cost Rate Using the Discounted Cash Flow Model for
RUCO Witness Rigsby's Proxy Group of Four Water Companies

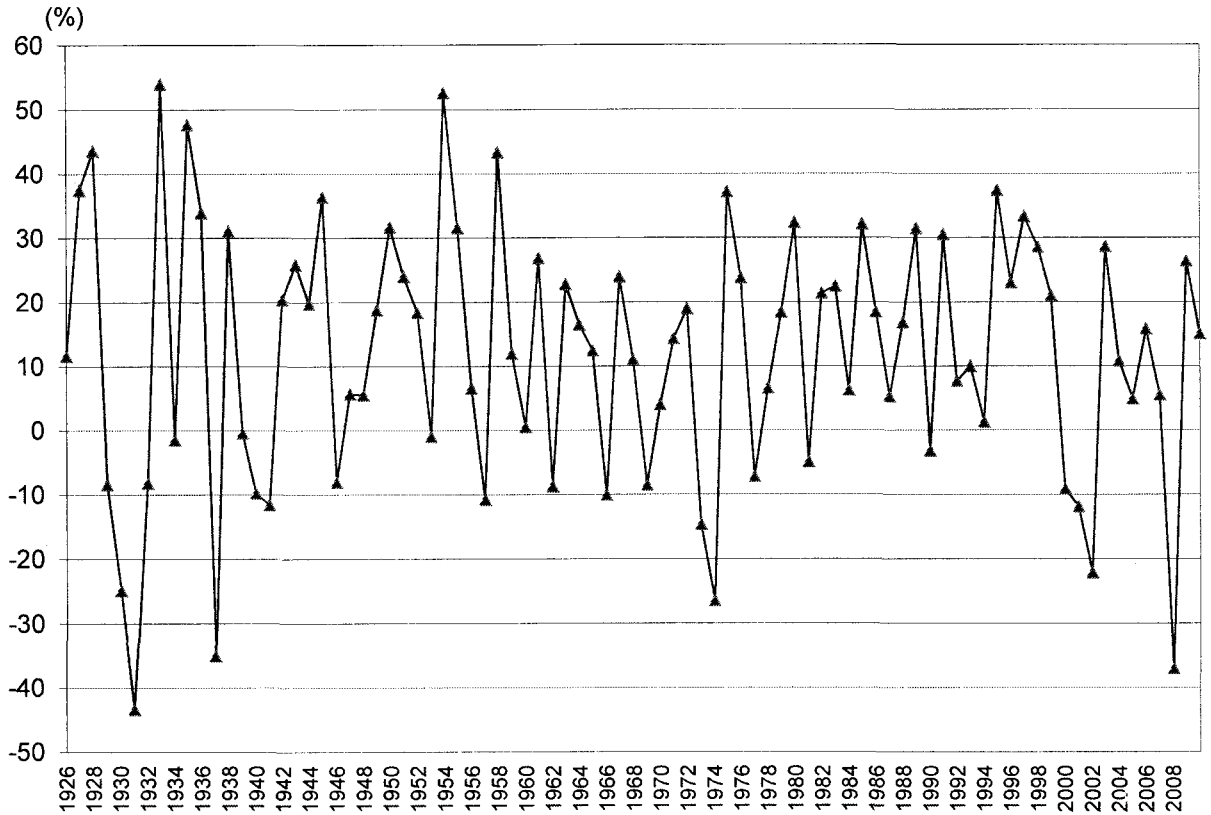
Proxy Group of Four Water Companies	1 Dividend Yield (1)	2 Internal Growth (br) (2)	3 External Growth (sv) (3)	4 Indicated Common Equity Cost Rate (4)
American States Water Co.	3.29 %	7.32 %	2.10 %	12.71 %
Aqua America, Inc.	2.86	5.54	0.99	9.39
California Water Service Group	3.35	5.06	5.11	13.52
SJW Corporation	2.94	2.24	5.60	10.78
Average				11.60 %

NA= Not Available
NMF = Not Meaningful Figure

Notes:

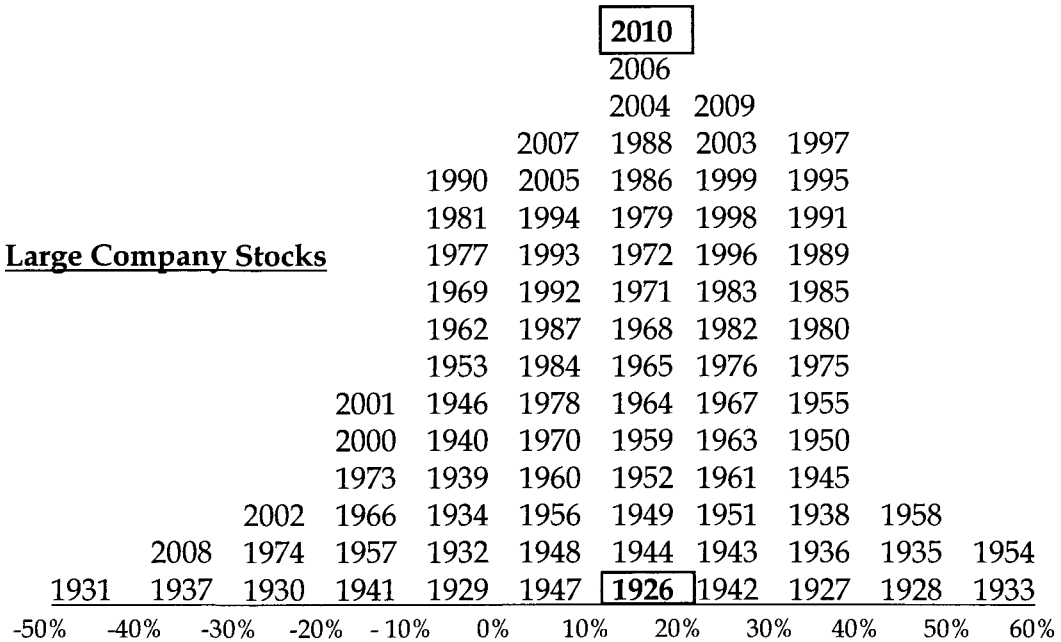
(1) From Schedule WAR-3.
(2) 2014 - 2016 projection in dividend growth on Schedule WAR-5.
(3) Share growth x market-to-book ratio derived from Schedule WAR-4, page 2 of 2.
(4) Sum of Columns 1 through 3.

Large Company Stock Returns
From 1926 to 2010



Source of Information:
Ibbotson® SBBI® - 2011 Valuation Yearbook - Market Results for Stocks Bonds Bills and Inflation - 1926-2010, Morningstar, Inc., 2011 Chicago, IL.

Total Returns on Large Company Stocks
1926 to 2010



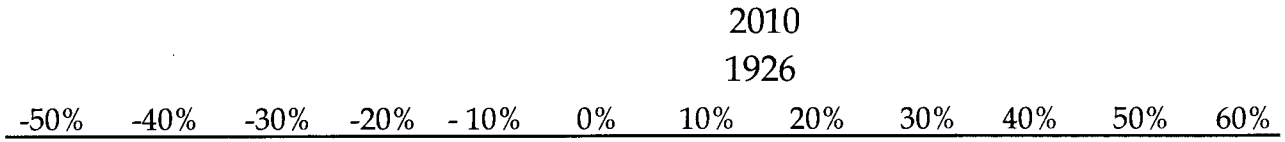
Arithmetic Mean: $r_A = \sum_{t=1}^{n} r_t / n$

Source : Ibbotson® SBBI ® - 2011 Valuation Yearbook - Market Results for Stocks, Bonds, Bills, and Inflation -1926-2010
Morningstar, Inc., 2011 Chicago, IL

Exhibit No. ___
Schedule PMA-5
Page 2 of 14

Total Returns on Large Company Stocks
1926 to 2010

Large Company Stocks



Geometric Mean: $r_G = \left[V_n / V_0 \right]^{1/n} - 1$

Source : Ibbotson® SBBI ® – 2011 Valuation Yearbook – Market Results for Stocks, Bonds, Bills, and Inflation –1926-2010
Morningstar, Inc., 2011 Chicago, IL

Exhibit No. ___
Schedule PMA-5
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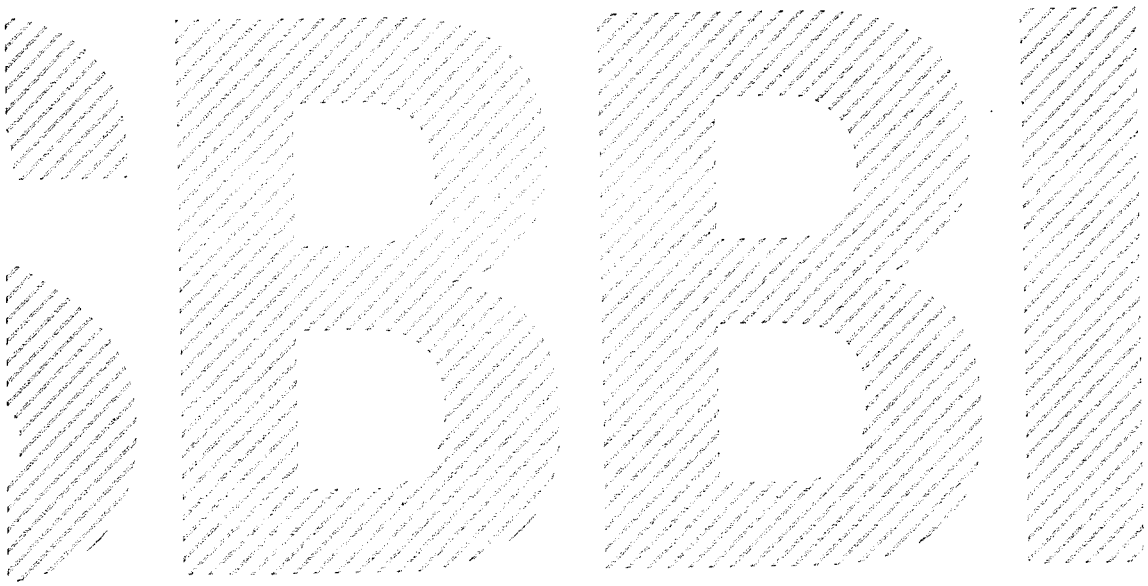
2011 Valuation Yearbook

Market Results for
Stocks, Bonds, Bills, and Inflation
1926–2010



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Chapter 5

The Equity Risk Premium

The expected equity risk premium can be defined as the additional return an investor expects to receive to compensate for the additional risk associated with investing in equities as opposed to investing in riskless assets. It is an essential component in several cost of equity estimation models, including the buildup method, the capital asset pricing model (CAPM), and the Fama-French three factor model. It is important to note that the expected equity risk premium, as it is used in discount rates and cost of capital analysis, is a forward-looking concept. That is, the equity risk premium that is used in the discount rate should be reflective of what investors think the risk premium will be going forward.

Unfortunately, the expected equity risk premium is unobservable in the market and therefore must be estimated. Typically, this estimation is arrived at through the use of historical data. The historical equity risk premium can be calculated by subtracting the long-term average of the income return on the riskless asset (Treasuries) from the long-term average stock market return (measured over the same period as that of the riskless asset). In using a historical measure of the equity risk premium, one assumes that what has happened in the past is representative of what might be expected in the future. In other words, the assumption one makes when using historical data to measure the expected equity risk premium is that the relationship between the returns of the risky asset (equities) and the riskless asset (Treasuries) is stable. The stability of this relationship will be examined later in this chapter.

Since the expected equity risk premium must be estimated, there is much controversy regarding how the estimation should be conducted. A variety of different approaches to calculating the equity risk premium have been utilized over the years. Such studies can be categorized into four groups based on the approaches they have taken. The first group of studies tries to derive the equity risk premium from historical returns between stocks and bonds as was mentioned above. The second group, embracing a supply side model, uses fundamental information such as earnings, dividends, or overall economic productivity to measure the expected equity risk premium. A third group adopts demand side models that derive the expected returns of equities through the payoff demanded by investors for bearing the risk of equity investments.[1] The opinions of financial professionals through broad surveys are relied upon by the fourth and final group.

The range of equity risk premium estimates used in practice is surprisingly large. Using a low equity risk premium estimate as opposed to a high estimate can have a significant impact on the estimated value of a stream of cash flows. This chapter addresses many of the controversies surrounding estimation of the equity risk premium and focuses primarily on the historical calculation but also discusses the supply side model.

Calculating the Historical Equity Risk Premium

In measuring the historical equity risk premium one must make a number of decisions that can impact the resulting figure; some decisions have a greater impact than others. These decisions include selecting the stock market benchmark, the risk-free asset, either an arithmetic or a geometric average, and the time period for measurement. Each of these factors has an impact on the resulting equity risk premium estimate.

The Stock Market Benchmark

The stock market benchmark chosen should be a broad index that reflects the behavior of the market as a whole. Two examples of commonly used indexes are the S&P 500® and the New York Stock Exchange Composite Index. Although the Dow Jones Industrial Average is a popular index, it would be inappropriate for calculating the equity risk premium because it is too narrow.

We use the total return of our large company stock index (currently represented by the S&P 500) as our market benchmark when calculating the equity risk premium. The S&P 500 was selected as the appropriate market benchmark because it is representative of a large sample of companies across a large number of industries. As of December 31, 1993, 88 separate industry groups were included in the index, and the industry composition of the index has not changed since. The S&P 500 is also one of

the most widely accepted market benchmarks. In short, the S&P 500 is a good measure of the equity market as a whole. Table 5-1 illustrates the equity risk premium calculation using several different market indices and the income return on three government bonds of different horizons.

Table 5-1: Equity Risk Premium with Different Market Indices

	Equity Risk Premia		
	Long-Horizon (%)	Intermediate-Horizon (%)	Short-Horizon (%)
S&P 500	6.72	7.22	8.22
Total Value-Weighted NYSE	6.52	7.03	8.02
NYSE Deciles 1–2	5.99	6.50	7.49

Data from 1926–2010.

The equity risk premium is calculated by subtracting the arithmetic mean of the government bond income return from the arithmetic mean of the stock market total return. Table 5-2 demonstrates this calculation for the long-horizon equity risk premium.

Table 5-2: Long-Horizon Equity Risk Premium Calculation

	Arithmetic Mean				
Long-Horizon	Market Total Return (%)		Risk-Free Rate (%)		Equity Risk Premium (%)
S&P 500	11.88	–	5.17	=	6.72*
Total Value-Weighted NYSE	11.69	–	5.17	=	6.52
NYSE Deciles 1–2	11.15	–	5.17	=	5.99*

Data from 1926–2010. *difference due to rounding.

Data for the New York Stock Exchange is obtained from Morningstar and the Center for Research in Security Prices (CRSP) at the University of Chicago's Graduate School of Business. The "Total" series is a capitalization-weighted index and includes all stocks traded on the New York Stock Exchange except closed-end mutual funds, real estate investment trusts, foreign stocks, and Americus Trusts. Capitalization-weighted means that the weight of each stock in the index, for a given month, is proportionate to its market capitalization (price times number of shares outstanding) at the beginning of that month. The "Decile 1–2" series includes all stocks with capitalizations that rank within the upper 20 percent of companies traded on the New York Stock Exchange, and it is therefore a large-capitalization index. For more information on the Center for Research in Security Pricing data methodology, see Chapter 7.

The resulting equity risk premia vary somewhat depending on the market index chosen. It is expected that using the "Total" series will result in a higher equity risk premium than using the "Decile 1–2" series, since the "Decile 1–2" series is a large-capitalization series. As of September 30, 2010, deciles 1–2 of the New York Stock Exchange contained the largest 274 companies traded on the exchange. The "Total" series includes smaller companies that have had historically higher returns, resulting in a higher equity risk premium.

The higher equity risk premium arrived at by using the S&P 500 as a market benchmark is more difficult to explain. One possible explanation is that the S&P 500 is not restricted to the largest 500 companies; other considerations such as industry composition are taken into account when determining if a company should be included in the index. Some smaller stocks are thus included, which may result in the higher equity risk premium of the index. Another possible explanation would be what is termed the "S&P inclusion effect." It is thought that simply being included among the stocks listed on the S&P 500 augments a company's returns. This is due to the large quantity of institutional funds that flow into companies that are listed in the index.

Comparing the S&P 500 total returns to those of another large-capitalization stock index may help evaluate the potential impact of the "S&P inclusion effect." Prior to March 1957, the S&P index that is used throughout this publication consisted of 90 of the largest stocks. The index composition was then changed to include 500 large-capitalization stocks that, as stated earlier, are not necessarily the 500 largest. Deciles 1–2 of the NYSE contained just over 200 of the largest companies, ranked by market capitalization, in March of 1957. The number of companies included in the deciles of the NYSE fluctuates from quarter to quarter, and by September of 2010, deciles 1–2 contained 274 companies. Though one cannot draw a causal relationship between the change in construction and the correlation of these two indices, this analysis does indicate that the "S&P inclusion effect" does not appear to be very significant in recent periods.

Another possible explanation could be differences in how survivorship is treated when calculating returns. The Center for Research in Security Prices includes the return for a company in the average decile return for the period following the company's removal from the decile,

whether caused by a shift to a different decile portfolio, bankruptcy, or other such reason. On the other hand, the S&P 500 does not make this adjustment. Once a company is no longer included among the S&P 500, its return is dropped from the index. However, this effect may be lessened by the advance announcement of companies being dropped from or added to the S&P 500. In many instances throughout this publication we will present equity risk premia using both the S&P 500 and the NYSE "Deciles 1–2" portfolio to provide a comparison between these large-capitalization benchmarks.

The Market Benchmark and Firm Size

Although not restricted to include only the 500 largest companies, the S&P 500 is considered a large company index. The returns of the S&P 500 are capitalization weighted, which means that the weight of each stock in the index, for a given month, is proportionate to its market capitalization (price times number of shares outstanding) at the beginning of that month. The larger companies in the index therefore receive the majority of the weight. The use of the NYSE "Deciles 1–2" series results in an even purer large company index. Yet many valuation professionals are faced with valuing small companies, which historically have had different risk and return characteristics than large companies. If using a large stock index to calculate the equity risk premium, an adjustment is usually needed to account for the different risk and return characteristics of small stocks. This will be discussed further in Chapter 7 on the size premium.

The Risk-Free Asset

The equity risk premium can be calculated for a variety of time horizons when given the choice of risk-free asset to be used in the calculation. The *2011 Ibbotson® Stocks, Bonds, Bills, and Inflation® Classic Yearbook* provides equity risk premia calculations for short-, intermediate-, and long-term horizons. The short-, intermediate-, and long-horizon equity risk premia are calculated using the income return from a 30-day Treasury bill, a 5-year Treasury bond, and a 20-year Treasury bond, respectively.

Although the equity risk premia of several horizons are available, the long-horizon equity risk premium is preferable for use in most business-valuation settings, even if an investor has a shorter time horizon. Companies are entities that generally have no defined life span; when determining a company's value, it is important to use a long-term discount rate because the life of the company is assumed to be infinite. For this reason, it is appropriate in most cases to use the long-horizon equity risk premium for business valuation.

20-Year versus 30-Year Treasuries

Our methodology for estimating the long-horizon equity risk premium makes use of the income return on a 20-year Treasury bond; however, the Treasury currently does not issue a 20-year bond. The 30-year bond that the Treasury recently began issuing again is theoretically more correct due to the long-term nature of business valuation, yet Ibbotson Associates instead creates a series of returns using bonds on the market with approximately 20 years to maturity. The reason for the use of a 20-year maturity bond is that 30-year Treasury securities have only been issued over the relatively recent past, starting in February of 1977, and were not issued at all through the early 2000s.

The same reason exists for why we do not use the 10-year Treasury bond—a long history of market data is not available for 10-year bonds. We have persisted in using a 20-year bond to keep the basis of the time series consistent.

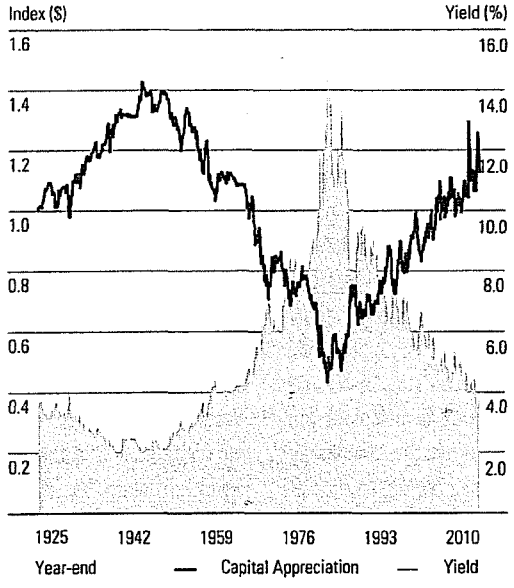
Income Return

Another point to keep in mind when calculating the equity risk premium is that the income return on the appropriate-horizon Treasury security, rather than the total return, is used in the calculation. The total return is comprised of three return components: the income return, the capital appreciation return, and the reinvestment return. The income return is defined as the portion of the total return that results from a periodic cash flow or, in this case, the bond coupon payment. The capital appreciation return results from the price change of a bond over a specific period. Bond prices generally change in reaction to unexpected fluctuations in yields. Reinvestment return is the return on a given month's investment income when reinvested into the same asset class in the subsequent months of the year. The income return is thus used in the estimation of the equity risk premium because it represents the truly riskless portion of the return.[2]

Yields have generally risen on the long-term bond over the 1926–2010 period, so it has experienced negative capital appreciation over much of this time. This trend has turned around since the 1980s, however. Graph 5-1 illustrates the yields on the long-term government bond series

compared to an index of the long-term government bond capital appreciation. In general, as yields rose, the capital appreciation index fell, and vice versa. Had an investor held the long-term bond to maturity, he would have realized the yield on the bond as the total return. However, in a constant maturity portfolio, such as those used to measure bond returns in this publication, bonds are sold before maturity (at a capital loss if the market yield has risen since the time of purchase). This negative return is associated with the risk of unanticipated yield changes.

Graph 5-1: Long-term Government Bond Yields versus Capital Appreciation Index



Data from 1925–2010.

For example, if bond yields rise unexpectedly, investors can receive a higher coupon payment from a newly issued bond than from the purchase of an outstanding bond with the former lower-coupon payment. The outstanding lower-coupon bond will thus fail to attract buyers, and its price will decrease, causing its yield to increase correspondingly, as its coupon payment remains the same. The newly priced outstanding bond will subsequently attract purchasers who will benefit from the shift in price and yield; however, those investors who already held the bond will suffer a capital loss due to the fall in price.

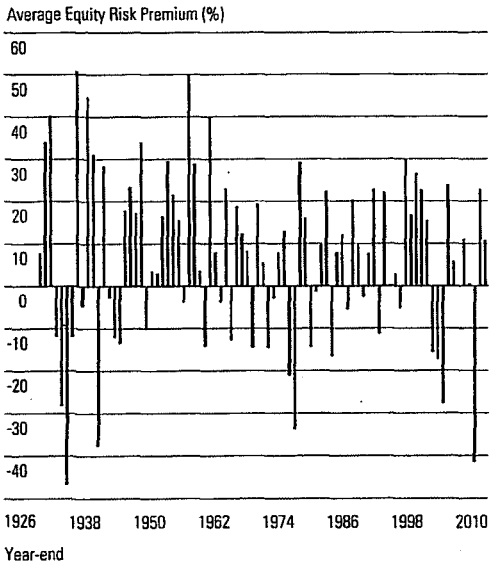
Anticipated changes in yields are assessed by the market and figured into the price of a bond. Future changes in yields that are not anticipated will cause the price of the bond to adjust accordingly. Price changes in bonds due to unanticipated changes in yields introduce price risk into the total return. Therefore, the total return on the bond series does not represent the riskless rate of return.The income return better represents the unbiased estimate of the purely riskless rate of return, since an investor can hold a bond to maturity and be entitled to the income return with no capital loss.

Arithmetic versus Geometric Means

The equity risk premium data presented in this book are arithmetic average risk premia as opposed to geometric average risk premia. The arithmetic average equity risk premium can be demonstrated to be most appropriate when discounting future cash flows. For use as the expected equity risk premium in either the CAPM or the building block approach, the arithmetic mean or the simple difference of the arithmetic means of stock market returns and riskless rates is the relevant number. This is because both the CAPM and the building block approach are additive models, in which the cost of capital is the sum of its parts. The geometric average is more appropriate for reporting past performance, since it represents the compound average return.

The argument for using the arithmetic average is quite straightforward. In looking at projected cash flows, the equity risk premium that should be employed is the equity risk premium that is expected to actually be incurred over the future time periods. Graph 5-2 shows the realized equity risk premium for each year based on the returns of the S&P 500 and the income return on long-term government bonds. (The actual, observed difference between the return on the stock market and the riskless rate is known as the realized equity risk premium.) There is considerable volatility in the year-by-year statistics. At times the realized equity risk premium is even negative.

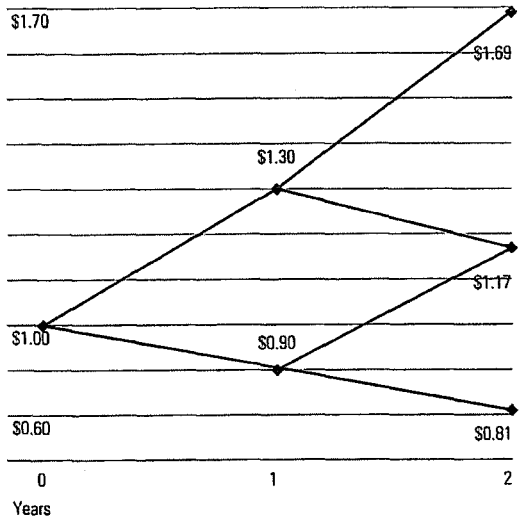
Graph 5-2: Realized Equity Risk Premium Per Year



Data from 1926–2010.

To illustrate how the arithmetic mean is more appropriate than the geometric mean in discounting cash flows, suppose the expected return on a stock is 10 percent per year with a standard deviation of 20 percent. Also assume that only two outcomes are possible each year: +30 percent and –10 percent (i.e., the mean plus or minus one standard deviation). The probability of occurrence for each outcome is equal. The growth of wealth over a two-year period is illustrated in Graph 5-3.

Graph 5-3: Growth of Wealth Example



The most common outcome of $1.17 is given by the geometric mean of 8.2 percent. Compounding the possible outcomes as follows derives the geometric mean:

$$\left[(1+0.30)\times(1-0.10)\right]^{1/2}-1=0.082$$

However, the expected value is predicted by compounding the arithmetic, not the geometric, mean. To illustrate this, we need to look at the probability-weighted average of all possible outcomes:

(0.25 × $1.69)	= $0.4225
+ (0.50 × $1.17)	= $0.5850
+ (0.25 × $0.81)	= $0.2025
Total	$1.2100

Therefore, $1.21 is the probability-weighted expected value. The rate that must be compounded to achieve the terminal value of $1.21 after 2 years is 10 percent, the arithmetic mean:

$$\$1\times(1+0.10)^2=\$1.21$$

The geometric mean, when compounded, results in the median of the distribution:

$$\$1\times(1+0.082)^2=\$1.17$$

The arithmetic mean equates the expected future value with the present value; it is therefore the appropriate discount rate.

Appropriate Historical Time Period

The equity risk premium can be estimated using any historical time period. For the U.S., market data exists at least as far back as the late 1800s. Therefore, it is possible to estimate the equity risk premium using data that covers roughly the past 100 years.

Our equity risk premium covers the time period from 1926 to the present. The original data source for the time series comprising the equity risk premium is the Center for Research in Security Prices. CRSP chose to begin their analysis of market returns with 1926 for two main reasons. CRSP determined that the time period around 1926 was

approximately when quality financial data became available. They also made a conscious effort to include the period of extreme market volatility from the late twenties and early thirties; 1926 was chosen because it includes one full business cycle of data before the market crash of 1929. These are the most basic reasons why our equity risk premium calculation window starts in 1926.

Implicit in using history to forecast the future is the assumption that investors' expectations for future outcomes conform to past results. This method assumes that the price of taking on risk changes only slowly, if at all, over time. This "future equals the past" assumption is most applicable to a random time-series variable. A time-series variable is random if its value in one period is independent of its value in other periods.

Does the Equity Risk Premium Revert to Its Mean Over Time?

Some have argued that the estimate of the equity risk premium is upwardly biased since the stock market is currently priced high. In other words, since there have been several years with extraordinarily high market returns and realized equity risk premia, the expectation is that returns and realized equity risk premia will be lower in the future, bringing the average back to a normalized level. This argument relies on several studies that have tried to determine whether reversion to the mean exists in stock market prices and the equity risk premium.[3] Several academics contradict each other on this topic; moreover, the evidence supporting this argument is neither conclusive nor compelling enough to make such a strong assumption.

Our own empirical evidence suggests that the yearly difference between the stock market total return and the U.S. Treasury bond income return in any particular year is random. Graph 5-2, presented earlier, illustrates the randomness of the realized equity risk premium.

A statistical measure of the randomness of a return series is its serial correlation. Serial correlation (or autocorrelation) is defined as the degree to which the return of a given series is related from period to period. A serial correlation near positive one indicates that returns are predictable from one period to the next period and are positively related. That is, the returns of one period are a good predictor of the returns in the next period. Conversely, a serial correlation near negative one indicates that the returns in one period are inversely related to those of the next period. A serial correlation near zero indicates that the returns are random or unpredictable from one period to the next. Table 5-3 contains the serial correlation of the market total returns, the realized long-horizon equity risk premium, and inflation.

Table 5-3: Interpretation of Annual Serial Correlations

Series	Serial Correlation	Interpretation
Large Company Stock Total Returns	0.02	Random
Equity Risk Premium	0.02	Random
Inflation Rates	0.64	Trend

Data from 1926–2010.

The significance of this evidence is that the realized equity risk premium next year will not be dependent on the realized equity risk premium from this year. That is, there is no discernable pattern in the realized equity risk premium—it is virtually impossible to forecast next year's realized risk premium based on the premium of the previous year. For example, if this year's difference between the riskless rate and the return on the stock market is higher than last year's, that does not imply that next year's will be higher than this year's. It is as likely to be higher as it is lower. The best estimate of the expected value of a variable that has behaved randomly in the past is the average (or arithmetic mean) of its past values.

Table 5-4 also indicates that the equity risk premium varies considerably by decade. The complete decades ranged from a high of 17.9 percent in the 1950s to a low of -3.7 percent in the 2000s. This look at historical equity risk premium reveals no observable pattern.

Table 5-4: Long-Horizon Equity Risk Premium by Decade (%)

1920s*	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2001-2010
17.6	2.3	8.0	17.9	4.2	0.3	7.9	12.1	-3.7	-1.1

Data from 1926–2010.
*Based on the period 1926–1929.

Finnerty and Leistikow perform more econometrically sophisticated tests of mean reversion in the equity risk premium. Their tests demonstrate that—as we suspected from our simpler tests—the equity risk premium that was realized over 1926 to the present was almost perfectly free of mean reversion and had no statistically identifiable time trends.[4] Lo and MacKinlay conclude, "the rejection of the random walk for weekly returns does not support a mean-reverting model of asset prices."

Choosing an Appropriate Historical Period

The estimate of the equity risk premium depends on the length of the data series studied. A proper estimate of the equity risk premium requires a data series long enough to give a reliable average without being unduly influenced by very good and very poor short-term returns. When calculated using a long data series, the historical equity risk premium is relatively stable.[5] Furthermore, because an average of the realized equity risk premium is quite volatile when calculated using a short history, using a long series makes it less likely that the analyst can justify any number he or she wants. The magnitude of how shorter periods can affect the result will be explored later in this chapter.

Some analysts estimate the expected equity risk premium using a shorter, more recent time period on the basis that recent events are more likely to be repeated in the near future; furthermore, they believe that the 1920s, 1930s, and 1940s contain too many unusual events. This view is suspect because all periods contain "unusual" events. Some of the most unusual events of the last hundred years took place quite recently, including the inflation of the late 1970s and early 1980s, the October 1987 stock market crash, the collapse of the high-yield bond market, the major contraction and consolidation of the thrift industry, the collapse of the Soviet Union, the development of the European Economic Community, the attacks of September 11, 2001 and the more recent liquidity crisis of 2008 and 2009.

It is even difficult for economists to predict the economic environment of the future. For example, if one were analyzing the stock market in 1987 before the crash, it would be statistically improbable to predict the impending short-term volatility without considering the stock market crash and market volatility of the 1929–1931 period. Without an appreciation of the 1920s and 1930s, no one would believe that such events could happen. The 85-year period starting with 1926 is representative of what can happen: it includes high and low returns, volatile and quiet markets, war and peace, inflation and deflation, and prosperity and depression. Restricting attention to a shorter historical period underestimates the amount of change that could occur in a long future period. Finally, because historical event-types (not specific events) tend to repeat themselves, long-run capital market return studies can reveal a great deal about the future. Investors probably expect "unusual" events to occur from time to time, and their return expectations reflect this.

A Look at the Historical Results

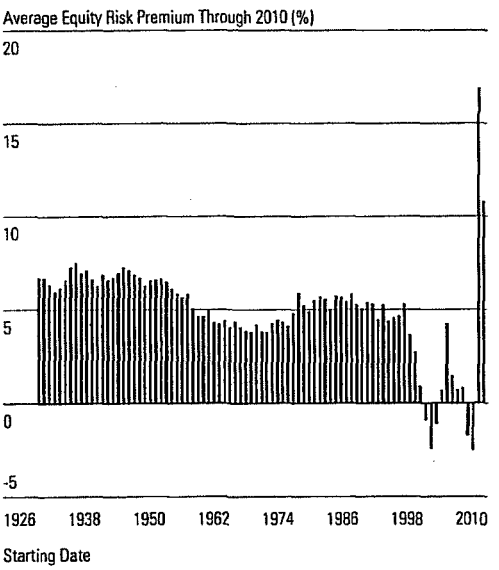
It is interesting to take a look at the realized returns and realized equity risk premium in the context of the above discussion. Table 5-5 shows the average stock market return and the average (arithmetic mean) realized long-horizon equity risk premium over various historical time periods. Similarly, Graph 5-5 shows the average (arithmetic mean) realized equity risk premium calculated through 2010 for different ending dates. The table and the graph both show that using a longer historical period provides a more stable estimate of the equity risk premium. The reason is that any unique period will not be weighted heavily in an average covering a longer historical period. It better represents the probability of these unique events occurring over a long period of time.

Table 5-5: *Stock Market Return and Equity Risk Premium Over Time*

Length (Yrs.)	Period Dates	Large Company Stock Arithmetic Mean Total Return (%)	Long-Horizon Equity Risk Premium (%)
85	1926–2010	11.8	6.7
70	1941–2010	12.6	7.0
60	1951–2010	12.3	6.1
50	1961–2010	11.2	4.4
40	1971–2010	11.8	4.5
30	1981–2010	12.2	5.0
20	1991–2010	11.0	5.3
15	1996–2010	8.9	3.7
10	2001–2010	3.6	-1.1
5	2006–2010	5.2	0.8

Data from 1926–2010.

Graph 5-4: Equity Risk Premium Using Different Starting Dates



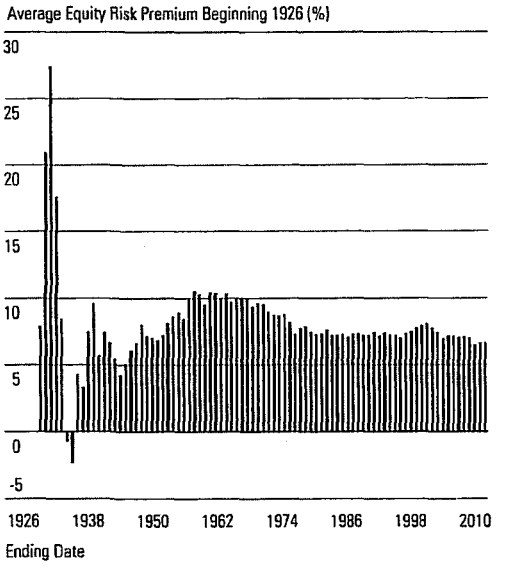
Data from 1926–2010.

Looking carefully at Graph 5-4 will clarify this point. The graph shows the realized equity risk premium for a series of time periods through 2010, starting with 1926. In other words, the first value on the graph represents the average realized equity risk premium over the period 1926–2010. The next value on the graph represents the average realized equity risk premium over the period 1927–2010, and so on, with the last value representing the average over the most recent five years, 2006–2010. Concentrating on the left side of Graph 5-5, one notices that the realized equity risk premium, when measured over long periods of time, is relatively stable. In viewing the graph from left to right, moving from longer to shorter historical periods, one sees that the value of the realized equity risk premium begins to decline significantly. Why does this occur? The reason is that the severe bear market of 1973–1974 is receiving proportionately more weight in the shorter, more recent average. If you continue to follow the line to the right, however, you will also notice that when 1973 and 1974 fall out of the recent average, the realized equity risk premium jumps up by nearly 1.2 percent.

Additionally, use of recent historical periods for estimation purposes can lead to illogical conclusions. As seen in Table 5-5, the bear market in the early 2000's and in 2008 has caused the realized equity risk premium in the shorter historical periods to be lower than the long-term average.

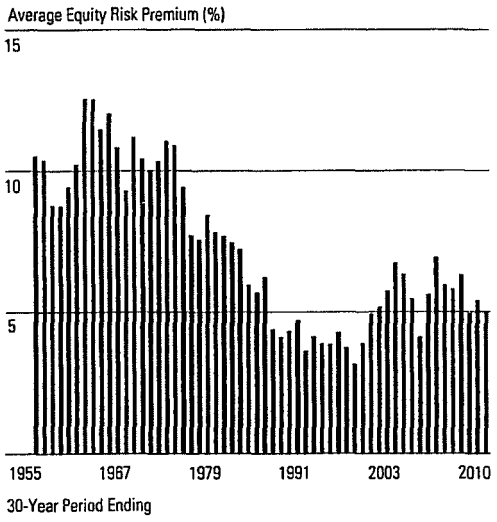
The impact of adding one additional year of data to a historical average is lessened the greater the initial time period of measurement. Short-term averages can be affected considerably by one or more unique observations. On the other hand, long-term averages produce more stable results. A series of graphs looking at the realized equity risk premium will illustrate this effect. Graph 5-5 shows the average (arithmetic mean) realized long-horizon equity risk premium starting in 1926. Each additional point on the graph represents the addition of another year to the average. Although the graph is extremely volatile in the beginning periods, the stability of the long-term average is quite remarkable. Again, the "unique" periods of time will not be weighted heavily in a long-term average, resulting in a more stable estimate.

Graph 5-5: Equity Risk Premium Using Different Ending Dates



Data from 1926–2010.

Graph 5-6: Equity Risk Premium Over 30-Year Periods



Data from 1926–2010.

Some practitioners argue for a shorter historical time period, such as 30 years, as a basis for the equity risk premium estimation. The logic for the use of a shorter period is that historical events and economic scenarios present before this time are unlikely to be repeated. Graph 5-6 shows the equity risk premium measured over 30-year periods, and it appears from the graph that the premium has been trending downwards. The 30-year equity risk premium remained close to 4 percent for several years in the 1980s and 1990s. However, it has fallen and then risen in the most recent 30-year periods.

The key to understanding this result lies again in the years 1973 and 1974. The oil embargo during this period had a tremendous effect on the market. The equity risk premium for these years alone was -21 and -34 percent, respectively. Periods that include the years 1973 and 1974 result in an average equity risk premium as low as 3.1 percent. In the most recent 30-year periods that excludes 1973 and 1974, the average rises to over 6 percent. The 2000s have also had an enormous effect on the equity risk premium.

It is difficult to justify such a large divergence in estimates of return over such a short period of time. This does not suggest, however, that the years 1973 and 1974 should be excluded from any estimate of the equity risk premium; rather, it emphasizes the importance of using a long historical period when measuring the equity risk premium in order to obtain a reliable average that is not overly influenced by short-term returns. The same holds true when analyzing the poor performance of the early 2000s and 2008.

Does the Equity Risk Premium Represent Minority or Controlling Interest?

There is quite a bit of confusion among valuation practitioners regarding the use of publicly traded company data to derive the equity risk premium. Is a minority discount implicit in this data? Recall that the equity risk premium is typically derived from the returns of a market index: the S&P 500, the New York Stock Exchange (NYSE), or the NYSE Deciles 1–2. (The size premia that are covered in Chapter 7 are derived from the returns of companies traded on the NYSE, in addition to those on the NYSE AMEX and NASDAQ). Both the S&P 500 and the NYSE include a preponderance of companies that are minority held. Does this imply that an equity risk premium (or size premium) derived from these data represents a minority interest premium? This is a critical issue that must be addressed by the valuation professional, since applying a minority discount or a control premium can have a material impact on the ultimate value derived in an appraisal.

Since most companies in the S&P 500 and the NYSE are minority held, some assume that the risk premia derived from these return data represent minority returns and therefore have a minority discount implicit within them. However, this assumption is not correct. The returns that are generated by the S&P 500 and the NYSE represent returns to equity holders. While most of these companies are minority held, there is no evidence that higher rates of return could be earned if these companies were suddenly acquired by majority shareholders. The equity risk premium represents expected premiums that holders of securities of a similar nature can expect to achieve on average into the future. There is no distinction between minority owners and controlling owners.

The discount rate is meant to represent the underlying risk of being in a particular industry or line of business. There are instances when a majority shareholder can acquire a company and improve the cash flows generated by that company. However, this does not necessarily have an impact on the general risk level of the cash flows generated by the company.

Bermuda Water Company
Correction of RUCO Witness Rigsby's CAPM Analysis
Reflecting Appropriate Arithmetic Mean Historical Market Risk Premiums,
Prospective Market Risk Premiums, Prospective Risk-Free Rates, and use of the ECAPM

	1	2	3	4	5	6
Proxy Group of Four Water Companies	Value Line Adjusted Beta	Market Risk Premium (1)	Risk-Free Rate (2)	Traditional CAPM Cost Rate (3)	ECAPM Cost Rate (4)	Indicated Common Equity Cost Rate (5)
American States Water Co.	0.75	8.16 %	4.67 %	10.79 %	11.30 %	
Aqua America, Inc.	0.65	8.16	4.67	9.97	10.69	
California Water Service Group	0.70	8.16	4.67	10.38	10.99	
SJW Corporation	0.90	8.16	4.67	12.01	12.22	
Average				10.79 %	11.30 %	11.05 %

See page 2 for notes.

Bermuda Water Company
Development of the Market-Required Rate of Return on Common Equity Using
the Capital Asset Pricing Model for
the Proxy Group of Four Water Companies
Adjusted to Reflect a Forecasted Risk-Free Rate and Market Return

Notes:

(1) For reasons explained in Ms. Ahern's accompanying rebuttal testimony, from the eight weeks ending August 12, 2011, Value Line Summary & Index, a forecasted 3-5 year total annual market return of 14.28% can be derived by averaging the eight weeks ended August 12, 2011 forecasted total 3-5 year total appreciation, converting it into an annual market appreciation and adding the Value Line average forecasted annual dividend yield.

The 3-5 year average total market appreciation of 59% produces a four-year average annual return of 12.29% ($(1.59^{.25}) - 1$). When the average annual forecasted dividend yield of 1.99% is added, a total average market return of 14.28% (1.99% + 12.29%) is derived.

The eight week forecasted total market return of 14.28% minus the forecasted risk-free rate of 4.67% (developed in Note 2) is 9.61% (14.28% - 4.67%). The Morningstar, Inc. (Ibbotson Associates) calculated market premium of 6.70% for the period 1926-2010 results from a total market return of 11.90% less the average income return on long-term U.S. Government Securities of 5.20% (11.90% - 5.20% = 6.70%). This is then averaged with the 9.61% Value Line market premium resulting in an 8.16% market premium. The 8.16% market premium is then multiplied by the beta in column 1 of page 1 of this Schedule.

(2) The average forecast based upon six quarterly estimates of 30-year Treasury Note yields per the consensus of nearly 50 economists reported in the Blue Chip Financial Forecasts dated August 1, 2011 (see page 3 of this Schedule). The estimates are detailed below:

	30-Year Treasury Note Yield
Third Quarter 2011	4.30
Fourth Quarter 2011	4.50
First Quarter 2012	4.60
Second Quarter 2012	4.70
Third Quarter 2012	4.90
Fourth Quarter 2012	5.00
Average	4.67%

(3) The traditional Capital Asset Pricing Model (CAPM) is applied using the following formula:

$R_S = R_F + \beta (R_M - R_F)$

Where R_S = Return rate of common stock
R_F = Risk Free Rate
β = Value Line Adjusted Beta
R_M = Return on the market as a whole

(4) The empirical CAPM is applied using the following formula:

$R_S = R_F + .25 (R_M - R_F) + .75 \beta (R_M - R_F)$

Where R_S = Return rate of common stock
R_F = Risk-Free Rate
β = Value Line Adjusted Beta
R_M = Return on the market as a whole

Source of Information: Value Line Summary & Index
Blue Chip Financial Forecasts, August 1, 2011
Value Line Investment Survey, Standard Edition, July 22, 2011
Ibbotson® SBBI® 2011 Valuation Yearbook – Market Results for
Stocks, Bonds, Bills, and Inflation – 1926 – 2010, Morningstar, Inc., 2011 Chicago, IL

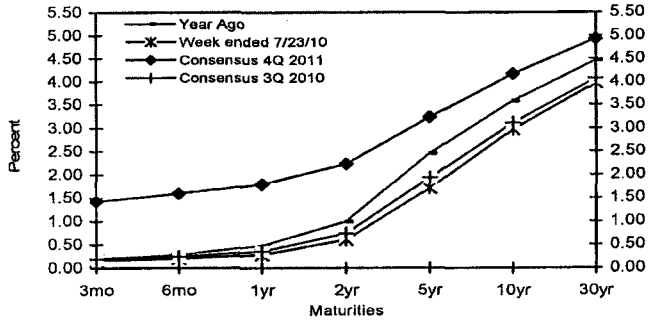
Consensus Forecasts Of U.S. Interest Rates And Key Assumptions[1]

	History								Consensus Forecasts-Quarterly Avg.					
	Average For Week Ending				Average For Month			Latest Q	3Q	4Q	1Q	2Q	3Q	4Q
Interest Rates	July 22	July 15	July 8	July 1	Jun	May	Apr.	2Q 2011	2011	2011	2012	2012	2012	2012
Federal Funds Rate	0.06	0.07	0.08	0.08	0.09	0.09	0.10	0.09	0.1	0.2	0.3	0.4	0.7	1.1
Prime Rate	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.3	3.3	3.3	3.4	3.8	4.1
LIBOR, 3-mo.	0.25	0.25	0.25	0.25	0.29	0.26	0.28	0.28	0.3	0.4	0.5	0.7	1.0	1.3
Commercial Paper, 1-mo.	0.09	0.09	0.10	0.08	0.11	0.11	0.14	0.12	0.2	0.2	0.3	0.5	0.9	1.2
Treasury bill, 3-mo.	0.02	0.02	0.02	0.02	0.04	0.04	0.06	0.05	0.1	0.1	0.3	0.4	0.8	1.1
Treasury bill, 6-mo.	0.06	0.06	0.07	0.10	0.10	0.09	0.12	0.10	0.1	0.2	0.4	0.6	0.9	1.3
Treasury bill, 1 yr.	0.16	0.16	0.19	0.19	0.18	0.19	0.25	0.21	0.2	0.4	0.5	0.8	1.1	1.5
Treasury note, 2 yr.	0.38	0.37	0.44	0.46	0.41	0.56	0.73	0.57	0.5	0.7	1.0	1.3	1.6	2.0
Treasury note, 5 yr.	1.47	1.48	1.67	1.67	1.58	1.84	2.17	1.86	1.7	2.0	2.2	2.4	2.7	2.9
Treasury note, 10 yr.	2.95	2.94	3.12	3.11	3.00	3.17	3.46	3.21	3.1	3.3	3.5	3.7	3.9	4.1
Treasury note, 30 yr.	4.25	4.21	4.35	4.36	4.23	4.29	4.50	4.34	4.3	4.5	4.6	4.7	4.9	5.0
Corporate Aaa bond	4.91	4.89	5.07	5.11	4.99	4.96	5.16	5.04	5.0	5.1	5.2	5.3	5.5	5.6
Corporate Baa bond	5.74	5.71	5.84	5.88	5.75	5.78	6.02	5.85	5.8	5.9	6.1	6.2	6.3	6.5
State & Local bonds	4.46	4.51	4.65	4.59	4.51	4.59	4.99	4.70	4.6	4.7	4.8	5.0	5.1	5.2
Home mortgage rate	4.52	4.51	4.60	4.51	4.51	4.64	4.84	4.66	4.6	4.8	5.0	5.2	5.4	5.6
	History								Consensus Forecasts-Quarterly					
	3Q	4Q	1Q	2Q	3Q	4Q	1Q	*2Q**	3Q	4Q	1Q	2Q	3Q	4Q
Key Assumptions	2009	2009	2010	2010	2010	2011	2011	*2011*	2011	2011	2012	2012	2012	2012
Major Currency Index	76.4	72.8	74.8	77.6	75.9	73.0	71.9	69.8	69.8	70.0	70.4	70.9	71.3	71.5
Real GDP	1.6	5.0	3.7	1.7	2.6	3.1	1.9	*1.8*	2.9	3.1	2.8	3.0	3.1	3.2
GDP Price Index	0.7	-0.2	1.0	1.9	2.1	0.4	2.0	*2.3*	1.9	1.7	2.0	2.0	2.0	2.0
Consumer Price Index	3.7	2.7	1.3	-0.5	1.4	2.6	5.2	4.1	2.1	2.1	2.3	2.2	2.3	2.3

Forecasts for interest rates and the Federal Reserve's Major Currency Index represent averages for the quarter. Forecasts for Real GDP, GDP Price Index and Consumer Price Index are seasonally-adjusted annual rates of change (saar). Individual panel members' forecasts are on pages 4 through 9. Historical data for interest rates except LIBOR is from Federal Reserve Release (FRSR) H.15. LIBOR quotes available from *The Wall Street Journal*. Interest rate definitions are the same as those in FRSR H.15. Treasury yields are reported on a constant maturity basis. Historical data for the Fed's Major Currency Index is from FRSR H.10 and G.5. Historical data for Real GDP and GDP Chained Price Index are from the Bureau of Economic Analysis (BEA). Consumer Price Index (CPI) history is from the Department of Labor's Bureau of Labor Statistics (BLS).). ***Figures for 2Q 2011 Real GDP and the GDP Chained Price Index are based on a special question asked of the panelists this month (see page 14).***

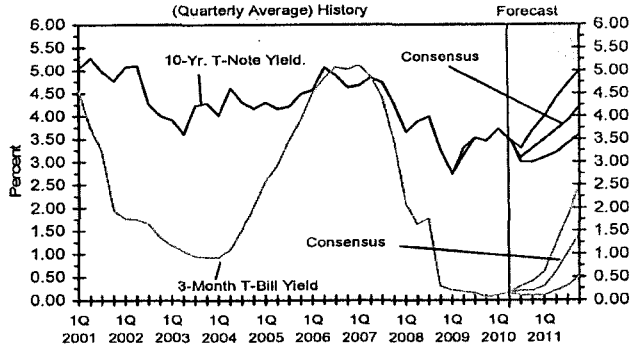
U.S. Treasury Yield Curve

Week ended July 23, 2010 and Year Ago vs.
3Q 2010 and 4Q 2011 Consensus Forecasts



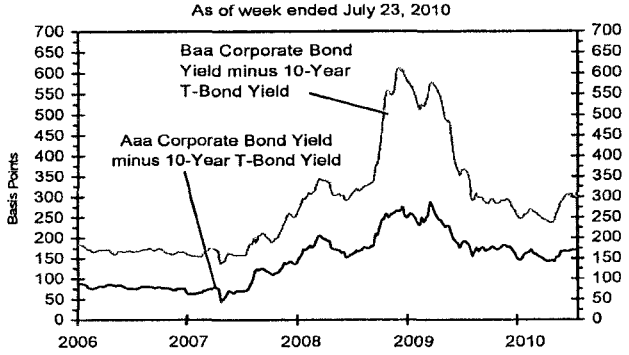
U.S. 3-Mo. T-Bills & 10-Yr. T-Note Yield

(Quarterly Average) History — Forecast



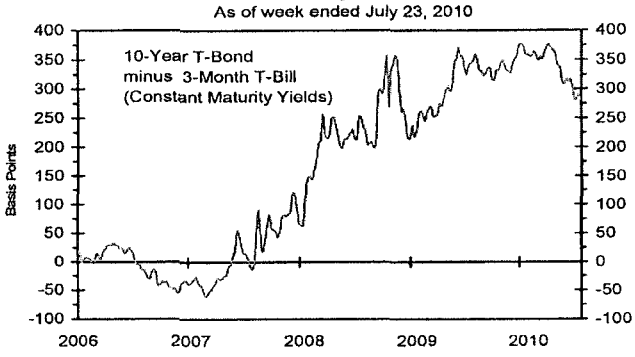
Corporate Bond Spreads

As of week ended July 23, 2010



U.S. Treasury Yield Curve

As of week ended July 23, 2010



Capital Structure Based upon Total Permanent Capital for the
Proxy Group of Four Water Companies
2006 - 2010, Inclusive

	2010	2009	2008	2007	2006	5 YEAR AVERAGE
American States Water Co.						
Long-Term Debt	44.30 %	46.95 %	46.25 %	46.99 %	48.61 %	46.62 %
Preferred Stock	0.00	0.00	0.00	0.00	0.00	0.00
Common Equity	55.70	53.05	53.75	53.01	51.39	53.38
Total Capital	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
Aqua America, Inc.						
Long-Term Debt	57.05 %	56.59 %	54.21 %	55.88 %	51.55 %	55.06 %
Preferred Stock	0.02	0.02	0.09	0.09	0.10	0.06
Common Equity	42.93	43.39	45.70	44.03	48.35	44.88
Total Capital	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
California Water Service Group						
Long-Term Debt	52.51 %	47.93 %	41.88 %	42.86 %	43.47 %	45.73 %
Preferred Stock	0.00	0.00	0.00	0.51	0.51	0.20
Common Equity	47.49	52.07	58.12	56.63	56.02	54.07
Total Capital	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
SJW Corporation						
Long-Term Debt	53.79 %	49.52 %	46.08 %	47.79 %	41.83 %	47.80 %
Preferred Stock	0.00	0.00	0.00	0.01	0.01	0.00
Common Equity	46.21	50.48	53.92	52.20	58.16	52.20
Total Capital	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %
Proxy Group of Four Water Companies						
Long-Term Debt	51.91 %	50.25 %	47.11 %	48.38 %	46.37 %	48.80 %
Preferred Stock	0.01	0.00	0.02	0.15	0.15	0.07
Common Equity	48.08	49.75	52.87	51.47	53.48	51.13
Total Capital	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %	100.00 %

Source of Information
EDGAR Online's I-Metrix Database
Annual Forms 10-K

Bermuda Water Company
Derivation of Investment Risk Adjustment Based upon
Ibbotson Associates' Size Premia for the Decile Portfolios of the NYSE/AMEX/NASDAQ

Line No.		1 Market Capitalization (1) (millions)	(times larger)	2 Applicable Decile of the NYSE/AMEX/ NASDAQ (2)	3 Applicable Size Premium (3)	4 Spread from Applicable Size Premium for (4)
1.	Bermuda Water Company					
a.	Based Upon the Proxy Group of Four Water Companies	$ 19.012		10	6.36%	
2.	Proxy Group of Four Water Companies	$ 1,208.594	63.6 x	6 - 7	1.85%	4.51%

	(A) Decile	(B) Number of Companies (millions)	(C) Recent Total Market Capitalization (millions)	(D) Recent Average Market Capitalization (millions)	(E) Size Premium (Return in Excess of CAPM) (2)
Largest	1	168	$ 8,586,385.656	$ 51,109.438	-0.38%
	2	181	1,873,378.709	$ 10,350.159	0.81%
	3	187	1,022,604.243	$ 5,468.472	1.01%
	4	185	594,702.185	$ 3,214.606	1.20%
	5	213	482,327.242	$ 2,264.447	1.81%
	6	230	360,140.550	$ 1,565.828	1.82%
	7	287	304,948.414	$ 1,062.538	1.88%
	8	361	239,018.595	$ 662.101	2.65%
	9	491	181,744.805	$ 370.152	2.94%
Smallest	10	1320	136,119.075	$ 103.121	6.36%

*From Ibbotson 2011 Yearbook

Notes:

(1) From Page 2 of this Schedule.
(2) Gleaned from Column (D) on the bottom of this page. The appropriate decile (Column (A)) corresponds to the market capitalization of the proxy group, which is found in Column 1.
(3) Corresponding risk premium to the decile is provided on Column (E) on the bottom of this page.
(4) Line No. 1a Column 3 – Line No. 2 Column 3 and Line No. 1b, Column 3 – Line No. 3 of Column 3 etc.. For example, the 4.51% in Column 4, Line No. 2 is derived as follows 4.51% = 6.36% - 1.85%.

Bermuda Water Company
Market Capitalization of Bermuda Water Company and
the Proxy Group of Four Water Companies

Company	Exchange	1 Common Stock Shares Outstanding at Fiscal Year End 2010 (millions)	2 Book Value per Share at Fiscal Year End 2010 (1)	3 Total Common Equity at Fiscal Year End 2010 (millions)	4 Average Stock Price (2)	5 Market-to-Book Ratio (3)	6 Market Capitalization (4) (millions)
Bermuda Water Company		NA	NA	$ 9.871 (5)	NA		
Based Upon the Proxy Group of Four Water Companies						192.6 % (6)	$ 19.012 (7)
Proxy Group of Four Water Companies							
American States Water Co.		18.631	$ 20.264	$ 377.541	$ 34.060	168.1 %	$ 634.567
Aqua America, Inc.		138.449	$ 8.481	$ 1,174.254	$ 21.650	255.3	$ 2,997.422
California Water Service Group		41.666	$ 10.453	$ 435.526	$ 18.390	175.9	$ 766.238
SJW Corporation		18.552	$ 13.747	$ 255.032	$ 23.510	171.0	$ 436.147
Average		54.324	$ 13.236	$ 560.588	$ 24.403	192.6 %	$ 1,208.594

NA= Not Available

Notes: (1) Column 3 / Column 1.
(2) From Schedule WAR-3.
(3) Column 4 / Column 2.
(4) Column 5 * Column 3.
(5) From Schedule A-3 of the Company Filing.
(6) The market-to-book ratio of Bermuda Water Company is assumed to be equal to the market-to-book ratio of the Proxy Group of Four Water Companies.

(7) Bermuda Water Company's common stock, if traded, would trade at a market-to-book ratio equal to the average market-to-book ratioof the Proxy Group of Four Water Companies, 192.6%, and Bermuda Water Company's market capitalization would therefore have been $19.012 million.

Source of Information: 2010 Annual Forms 10K
yahoo.finance.com

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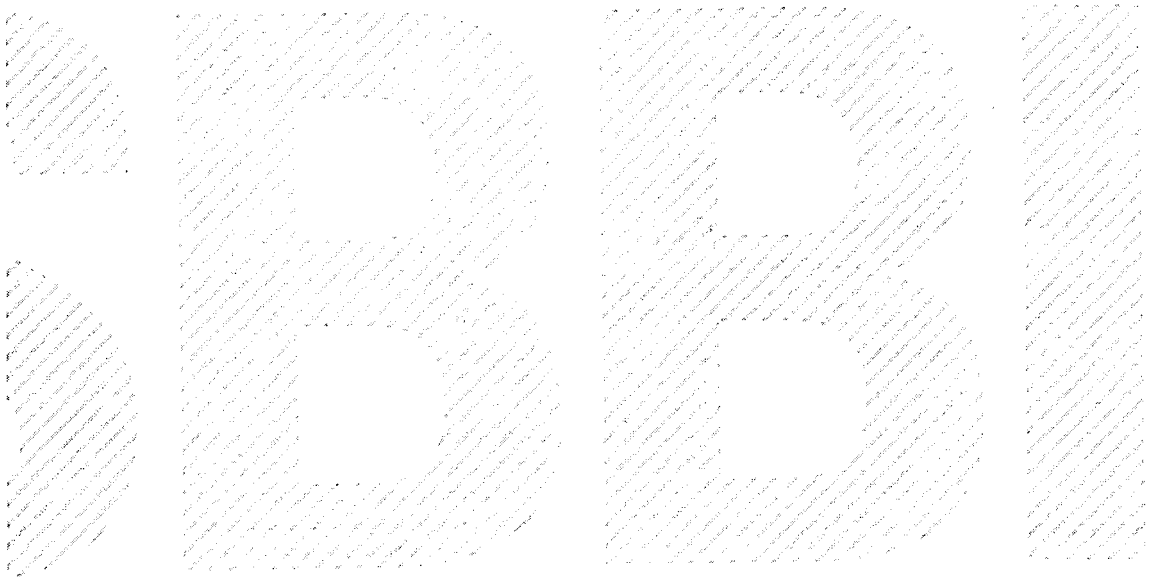
2011 Valuation Yearbook

Market Results for
Stocks, Bonds, Bills, and Inflation
1926–2010



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Chapter 7

Firm Size and Return

The Firm Size Phenomenon

One of the most remarkable discoveries of modern finance is that of a relationship between firm size and return. The relationship cuts across the entire size spectrum but is most evident among smaller companies, which have higher returns on average than larger ones. Many studies have looked at the effect of firm size on return.[1] In this chapter, the returns across the entire range of firm size are examined.

Size and Liquidity

Capitalization is not necessarily the underlying cause of the higher returns for smaller companies. While smaller companies are usually less liquid, with fewer shares traded on any given day, not all companies of the same size have the same liquidity. Stocks that are more liquid have higher valuations for the same cash flows because they have a lower cost of capital and commensurately lower returns on average. Stocks that are less liquid have a higher cost of capital and higher returns on average.[2]

While it would be very useful to estimate the equity cost of capital of companies that are not publicly traded, there is not a direct measure of liquidity for these companies because there are no public trades. Thus, there is usually no share turnover, no bid/ask spreads, etc. in which to measure liquidity. Even though liquidity is not directly observable, capitalization is; thus the size premium can serve as a partial measure of the increased cost of capital of a less liquid stock.

Size premiums presented in this book are measured from publicly traded companies of various sizes and therefore do not represent the full cost of capital for non-traded companies. The valuation for a non-publicly traded company should also reflect a discount for the very fact that it is not traded. This would be an liquidity discount and could be applied to the valuation directly, or alternatively reflected as an liquidity premium in the cost of capital.

This chapter does not tell you how to estimate this incremental liquidity valuation discount (or cost of capital liquidity premium) that is not covered by the size premium. At the end of this chapter, we show some empirical results on the impact of liquidity on stock returns.

Construction of the Decile Portfolios

The portfolios used in this chapter are those created by the Center for Research in Security Prices (CRSP) at the University of Chicago's Graduate School of Business. CRSP has refined the methodology of creating size-based portfolios and has applied this methodology to the entire universe of NYSE/AMEX/NASDAQ-listed securities going back to 1926.

The New York Stock Exchange universe excludes closed-end mutual funds, preferred stocks, real estate investment trusts, foreign stocks, American Depository Receipts, unit investment trusts, and Americus Trusts. All companies on the NYSE are ranked by the combined market capitalization of their eligible equity securities. The companies are then split into 10 equally populated groups, or deciles. Eligible companies traded on the NYSE, the NYSE Amex Equities (AMEX), and the Nasdaq National Market (NASDAQ) are then assigned to the appropriate deciles according to their capitalization in relation to the NYSE breakpoints. The portfolios are rebalanced, using closing prices for the last trading day of March, June, September, and December. Securities added during the quarter are assigned to the appropriate portfolio when two consecutive month-end prices are available. If the final NYSE price of a security that becomes delisted is a month-end price, then that month's return is included in the quarterly return of the security's portfolio. When a month-end NYSE price is missing, the month-end value of the security is derived from merger terms, quotations on regional exchanges, and other sources. If a month-end value still is not determined, the last available daily price is used.

In October 2008, NYSE Euronext acquired the American Stock Exchange (AMEX) and rebranded the index as NYSE Amex Equities. To ease confusion, we will continue to refer to this index as AMEX through out this chapter.

Table 7-1: Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
Number of Companies, Historical and Recent Market Capitalization

Decile	Historical Average Percentage of Total Capitalization	Recent Number of Companies	Recent Decile Market Capitalization (in Thousands)	Recent Percentage of Total Capitalization
1-Largest	63.26%	168	8,586,385,656	62.30%
2	13.94	181	1,873,378,709	13.59
3	7.53	187	1,022,604,243	7.42
4	4.71	185	594,702,185	4.32
5	3.24	213	482,327,242	3.50
6	2.39	230	360,140,550	2.61
7	1.76	287	304,948,414	2.21
8	1.31	361	239,018,595	1.73
9	1.03	491	181,744,805	1.32
10-Smallest	0.83	1,320	136,119,075	0.99
Mid-Cap 3-5	15.48	585	2,099,633,670	15.24
Low-Cap 6-8	5.46	878	904,107,559	6.56
Micro-Cap 9-10	1.86	1,811	317,863,880	2.31

Data from 1926–2010. Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

Historical average percentage of total capitalization shows the average, over the last 85 years, of the decile market values as a percentage of the total NYSE/AMEX/NASDAQ calculated each month. Number of companies in deciles, recent market capitalization of deciles and recent percentage of total capitalization are as of September 30, 2010.

Table 7-2: Size-Decile Portfolios of the NYSE/AMEX/NASDAQ,
Largest Company and Its Market Capitalization by Decile

Decile	Recent Market Capitalization (in Thousands)	Company Name
1-Largest	$314,622,574	Exxon Mobil Corp.
2	15,079,529	H.J. Heinz Co.
3	6,793,876	Ameren Corp.
4	3,710,985	Timken Co.
5	2,509,152	Compass Minerals Intl Inc.
6	1,775,966	Trinity Industries Inc.
7	1,212,290	Delphi Financial Group
8	771,789	RSC Holdings Inc.
9	477,539	DSW Inc.
10-Smallest	235,647	McClatchy Co.

Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission. Market capitalization and name of largest company in each decile as of September 30, 2010.

Base security returns are monthly holding period returns. All distributions are added to the month-end prices, and appropriate price adjustments are made to account for stock splits and dividends. The return on a portfolio for one month is calculated as the weighted average of the returns for its individual stocks. Annual portfolio returns are calculated by compounding the monthly portfolio returns.

Size of the Deciles

Table 7-1 reveals that the top three deciles of the NYSE/AMEX/NASDAQ account for most of the total market value of its stocks. Nearly two-thirds of the market value is represented by the first decile, which currently consists of 165 stocks, while the smallest decile accounts for just over one percent of the market value. The data in the second column of Table 7-1 are averages across all 85 years. Of course, the proportion of market value represented by the various deciles varies from year to year.

Columns three and four give recent figures on the number of companies and their market capitalization, presenting a snapshot of the structure of the deciles as of September 30, 2010.

Table 7-2 gives the current breakpoints that define the composition of the NYSE/AMEX/NASDAQ size deciles. The largest company and its market capitalization are presented for each decile. Table 7-3 shows the historical breakpoints for each of the three size groupings presented throughout this chapter. Mid-cap stocks are defined here as the aggregate of deciles 3–5. Based on the most recent data (Table 7-2), companies within this mid-cap range have market capitalizations at or below $6,793,876,000 but greater than $1,775,966,000. Low-cap stocks include deciles 6–8 and currently include all companies in the NYSE/AMEX/NASDAQ with market capitalizations at or below $1,775,966,000 but greater than $477,539,000. Micro-cap stocks include deciles 9–10 and include companies with market capitalizations at or below $477,539,000. The market capitalization of the smallest company included in the micro-capitalization group is currently $1,222,000.

Presentation of the Decile Data

Summary statistics of annual returns of the 10 deciles over 1926–2010 are presented in Table 7-4. Note from this exhibit that both the average return and the total risk, or standard deviation of annual returns, tend to increase as one moves from the largest decile to the smallest. Furthermore, the serial correlations of returns are near zero for all but the smallest deciles. Serial correlations and their significance will be discussed in detail later in this chapter.

Table 7-3
Size-Decile Portfolios of the NYSE/AMEX/NASDAQ:
Largest and Smallest Company by Size Group (Continued)

1926–1965

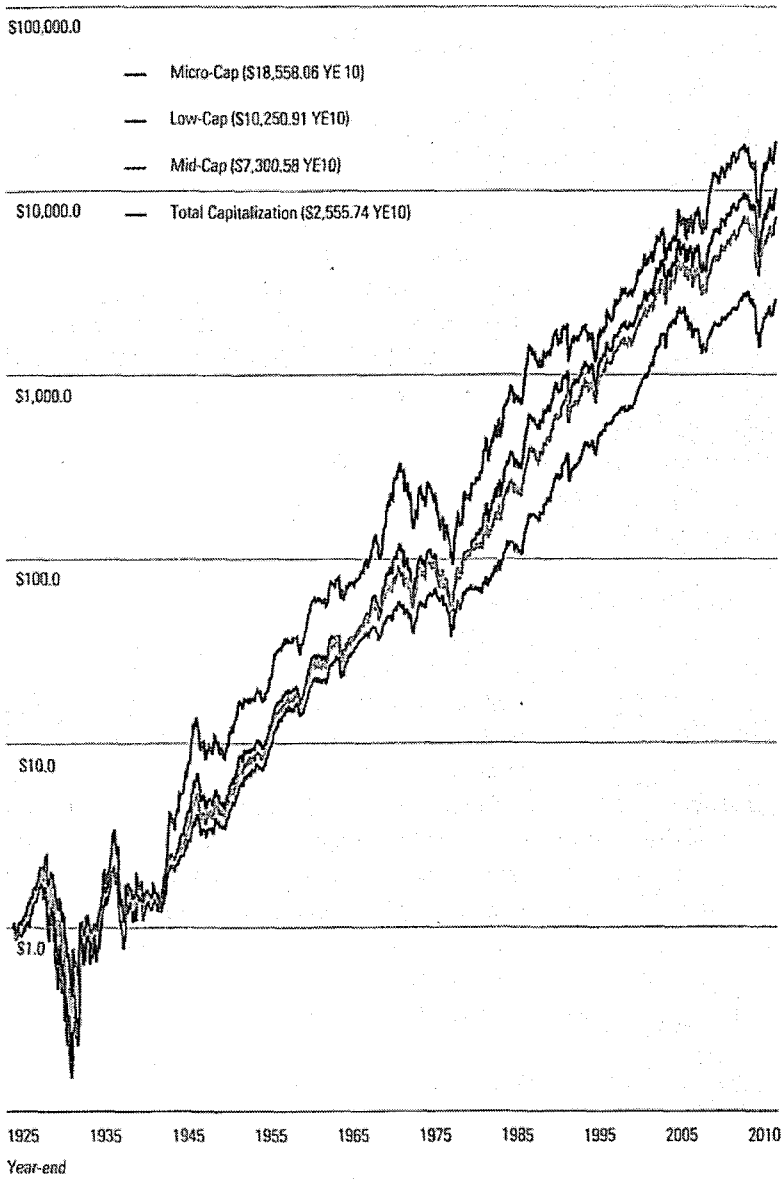
	Capitalization of Largest Company (in Thousands)			Capitalization of Smallest Company (in Thousands)		
Date	Mid-Cap	Low-Cap	Micro-Cap	Mid-Cap	Low-Cap	Micro-Cap
(Sept 30)	3–5	6–8	9–10	3–5	6–8	9–10
1926	$62,865	$14,128	$4,188	$14,363	$4,200	$31
1927	74,498	16,200	4,560	16,250	4,613	41
1928	89,494	21,350	5,976	21,500	6,028	82
1929	109,463	23,194	5,749	23,386	5,769	70
1930	59,033	11,550	2,413	11,557	2,422	24
1931	27,750	5,171	1,079	5,250	1,088	10
1932	26,240	4,175	1,006	4,187	1,013	49
1933	36,313	6,192	1,499	6,208	1,515	88
1934	32,663	5,813	1,440	5,875	1,443	63
1935	41,652	8,247	1,875	8,249	1,888	47
1936	53,606	12,917	3,294	13,031	3,325	90
1937	42,384	10,888	2,928	10,896	2,933	83
1938	40,140	8,574	2,213	8,660	2,235	53
1939	40,533	9,836	2,721	9,862	2,749	100
1940	32,813	8,832	2,100	8,867	2,112	93
1941	33,333	8,800	2,396	8,813	2,431	82
1942	28,091	7,308	2,040	7,372	2,052	145
1943	43,425	11,060	3,652	11,100	3,718	291
1944	45,659	13,466	4,820	13,500	4,875	328
1945	58,029	18,910	7,205	18,947	7,228	642
1946	59,575	18,070	7,080	18,075	7,132	613
1947	61,443	18,464	6,689	18,506	6,711	630
1948	58,468	17,216	6,281	17,224	6,297	665
1949	61,264	16,503	5,668	16,564	5,670	455
1950	72,628	20,904	7,325	21,021	7,363	605
1951	92,894	25,493	8,438	25,549	8,441	699
1952	94,051	25,114	8,366	25,118	8,428	480
1953	92,790	23,808	7,650	23,836	7,688	355
1954	134,699	31,612	9,328	31,625	9,444	509
1955	162,221	42,120	12,215	42,485	12,276	600
1956	178,589	45,750	13,283	45,765	13,298	601
1957	170,079	42,234	12,552	42,470	12,650	601
1958	219,269	52,572	15,513	52,601	15,561	800
1959	243,709	61,458	19,200	61,620	19,278	1,768
1960	240,600	58,590	18,340	58,591	18,480	775
1961	308,900	74,919	22,762	75,082	22,770	2,160
1962	252,500	60,771	19,327	61,053	19,346	236
1963	310,626	74,531	24,827	74,556	24,852	158
1964	358,730	81,950	27,931	82,429	28,092	278
1965	411,397	91,550	31,533	92,442	31,650	339

Table 7-3 (Continued)
Size-Decile Portfolios of the NYSE/AMEX/NASDAQ:
Largest and Smallest Company by Size Group (Continued)

1966–2010

	Capitalization of Largest Company (in Thousands)			Capitalization of Smallest Company (in Thousands)		
Date	Mid-Cap	Low-Cap	Micro-Cap	Mid-Cap	Low-Cap	Micro-Cap
(Sept 30)	3–5	6–8	9–10	3–5	6–8	9–10
1966	355,976	86,301	29,616	86,309	29,628	162
1967	494,221	132,178	48,139	132,271	48,182	519
1968	545,337	156,776	62,725	156,914	62,920	2,661
1969	496,371	141,542	48,785	142,010	48,840	1,384
1970	452,155	115,353	37,038	116,246	37,071	1,216
1971	540,926	140,357	44,888	140,397	44,907	908
1972	550,011	140,676	41,938	140,711	41,958	996
1973	507,165	116,042	33,930	116,087	33,941	593
1974	278,010	61,009	18,020	61,379	18,032	244
1975	413,863	90,766	25,638	90,787	25,692	468
1976	554,693	120,260	34,541	120,379	34,542	362
1977	567,353	138,534	39,245	138,707	39,398	617
1978	626,508	180,503	52,850	181,148	52,875	1,071
1979	722,753	196,852	56,404	197,312	56,420	798
1980	843,224	232,001	60,516	232,504	60,550	1,197
1981	848,189	221,008	58,385	223,672	58,451	1,248
1982	857,822	229,809	60,007	230,450	60,138	943
1983	1,223,644	360,242	99,038	360,591	99,444	1,689
1984	1,192,530	340,262	91,162	340,950	91,492	1,935
1985	1,328,504	341,504	90,773	342,770	91,018	750
1986	1,757,617	394,738	96,391	395,134	96,480	656
1987	2,145,644	499,940	116,458	500,270	116,553	811
1988	1,928,870	432,006	96,064	434,359	96,086	308
1989	2,332,567	515,156	103,620	517,276	104,005	391
1990	1,809,083	360,000	71,792	360,715	71,825	199
1991	2,321,976	492,945	90,285	493,636	90,317	166
1992	2,471,131	512,510	102,376	513,251	102,969	325
1993	2,835,393	614,015	147,083	619,625	147,276	559
1994	2,630,763	633,433	151,759	633,578	151,814	817
1995	2,999,061	690,600	168,873	692,893	168,877	749
1996	3,222,158	747,859	192,659	748,150	192,788	1,405
1997	3,936,936	942,616	260,119	944,497	260,269	1,650
1998	3,537,903	723,517	192,465	724,133	192,864	515
1999	3,715,994	801,711	201,787	803,529	201,817	1,123
2000	4,592,543	922,582	189,370	922,800	189,474	1,287
2001	4,169,705	913,122	211,085	913,428	211,101	418
2002	3,998,995	926,123	242,171	926,647	242,226	269
2003	5,180,303	1,241,508	365,091	1,243,618	365,772	1,563
2004	6,320,713	1,558,386	512,655	1,560,109	512,954	1,293
2005	7,590,867	1,806,555	593,522	1,810,905	593,581	1,611
2006	7,913,370	1,985,969	639,397	1,988,656	639,915	1,746
2007	8,677,165	2,292,931	631,865	2,293,645	631,888	1,422
2008	5,840,629	1,680,752	442,559	1,688,943	442,596	1,462
2009	5,936,147	1,600,169	431,256	1,602,429	432,175	1,007
2010	6,793,876	1,775,966	477,539	1,778,756	478,102	1,222

Graph 7-1: Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
Wealth Indices of Investments in Mid-, Low-, Micro-, and Total Capitalization Stocks
Index (Year-End 1925 = $1.00)



Data from 1925–2010.

Graph 7-1 depicts the growth of one dollar invested in each of three NYSE/AMEX/NASDAQ groups broken down into mid-cap, low-cap, and micro-cap stocks. The index value of the entire NYSE/AMEX/NASDAQ is also included. All returns presented are value-weighted based on the market capitalizations of the deciles contained in each subgroup. The sheer magnitude of the size effect in some years is noteworthy. While the largest stocks actually declined 9 percent in 1977, the smallest stocks rose more than 20 percent. A more extreme case occurred in the depression-recovery year of 1933, when the difference between the first and tenth decile returns was far more substantial, with the largest stocks rising 46 percent, and the smallest stocks rising 218 percent. This divergence in the performance of small and large company stocks is a common occurrence.

Table 7-4: Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
Summary Statistics of Annual Returns

Decile	*Geometric* Mean	*Arithmetic* Mean	*Standard* Deviation	*Serial* Correlation
1-Largest	9.1	10.9	19.3	0.07
2	10.5	12.9	22.3	0.01
3	10.9	13.6	23.8	-0.03
4	10.8	13.9	26.0	-0.02
5	11.4	14.8	26.8	-0.03
6	11.4	15.0	27.5	0.02
7	11.4	15.4	29.7	0.01
8	11.6	16.5	34.3	0.05
9	11.7	17.2	36.5	0.04
10-Smallest	13.3	21.0	44.9	0.14
Mid Cap	11.0	13.9	24.9	-0.03
Low Cap	11.5	15.4	29.3	0.02
Micro	12.3	18.4	39.0	0.07
NYSE/AMEX/ NASDAQ Total Value Weighted Index	9.7	11.7	20.4	0.02

Data from 1926–2010. Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

Results are for quarterly re-ranking for the deciles. The small company stock summary statistics presented in earlier chapters comprise a re-ranking of the portfolios every five years prior to 1982.

Aspects of the Firm Size Effect

The firm size phenomenon is remarkable in several ways. First, the greater risk of small stocks does not, in the context of the capital asset pricing model (CAPM), fully account for their higher returns over the long term. In the CAPM only systematic, or beta risk, is rewarded; small company stocks have had returns in excess of those implied by their betas.

Second, the calendar annual return differences between small and large companies are serially correlated. This suggests that past annual returns may be of some value in predicting future annual returns. Such serial correlation, or autocorrelation, is practically unknown in the market for large stocks and in most other equity markets but is evident in the size premia.

Table 7-5: Size-Decile Portfolios of the NYSE/AMEX/NASDAQ Long-Term Returns in Excess of CAPM

Decile	Beta*	Arithmetic Mean Return (%)	Actual Return in Excess of Riskless Rate** (%)	CAPM Return in Excess of Riskless Rate† (%)	Size Premium (Return in Excess of CAPM) (%)
1-Largest	0.91	10.92	5.76	6.14	-0.38
2	1.03	12.92	7.76	6.95	0.81
3	1.10	13.56	8.39	7.39	1.01
4	1.12	13.91	8.75	7.55	1.20
5	1.16	14.75	9.59	7.77	1.81
6	1.19	14.95	9.78	7.96	1.82
7	1.24	15.38	10.21	8.34	1.88
8	1.30	16.54	11.37	8.73	2.65
9	1.35	17.16	11.99	9.05	2.94
10-Smallest	1.41	20.97	15.81	9.45	6.36
Mid-Cap, 3-5	1.12	13.87	8.71	7.51	1.20
Low-Cap, 6-8	1.23	15.38	10.22	8.24	1.98
Micro-Cap, 9-10	1.36	18.37	13.20	9.12	4.07

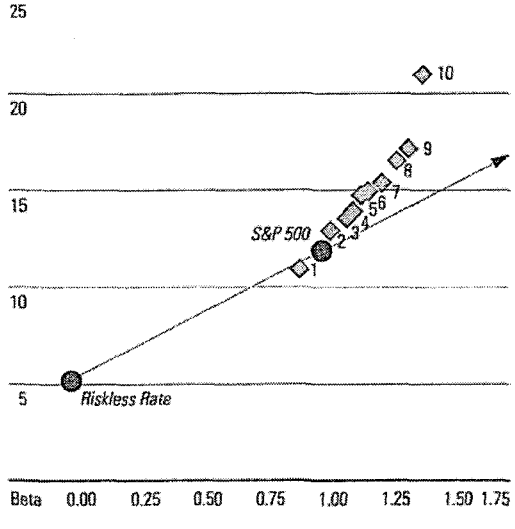
Data from 1926–2010.

*Betas are estimated from monthly returns in excess of the 30-day U.S. Treasury bill total return, January 1926–December 2010.

**Historical riskless rate measured by the 85-year arithmetic mean income return component of 20-year government bonds (5.17).

†Calculated in the context of the CAPM by multiplying the equity risk premium by beta. The equity risk premium is estimated by the arithmetic mean total return of the S&P 500 (11.68 percent) minus the arithmetic mean income return component of 20-year government bonds (5.17 percent) from 1926–2010.

Graph 7-2: Security Market Line Versus Size-Decile Portfolios of the NYSE/AMEX/NASDAQ



Data from 1926–2010.

Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

Third, the firm size effect is seasonal. For example, small company stocks outperformed large company stocks in the month of January in a large majority of the years. Such predictability is surprising and suspicious in light of modern capital market theory. These three aspects of the firm size effect—long-term returns in excess of systematic risk, serial correlation, and seasonality—will be analyzed thoroughly in the following sections.

Long-Term Returns in Excess of Systematic Risk

The capital asset pricing model (CAPM) does not fully account for the higher returns of small company stocks. Table 7-5 shows the returns in excess of systematic risk over the past 85 years for each decile of the NYSE/AMEX/NASDAQ. Recall that the CAPM is expressed as follows:

$$k_s = r_f + (\beta_s \times ERP)$$

Table 7-5 uses the CAPM to estimate the return in excess of the riskless rate and compares this estimate to historical performance. According to the CAPM, the expected return on a security should consist of the riskless rate plus an additional return to compensate for the systematic risk of the security. The return in excess of the riskless rate is estimated in the context of the CAPM by multiplying the equity risk premium by β (beta). The equity risk premium is the return that compensates investors for taking on risk equal to the risk of the market as a whole (systematic risk).[3] Beta measures the extent to which a security or portfolio is exposed to systematic risk.[4] The beta of each decile indicates the degree to which the decile's return moves with that of the overall market.

A beta greater than one indicates that the security or portfolio has greater systematic risk than the market; according to the CAPM equation, investors are compensated for taking on this additional risk. Yet, Table 7-5 illustrates that the smaller deciles have had returns that are not fully explained by their higher betas. This return in excess of that predicted by CAPM increases as one moves from the largest companies in decile 1 to the smallest in decile 10. The excess return is especially pronounced for micro-cap stocks (deciles 9–10). This size-related phenomenon has prompted a revision to the CAPM, which includes a size premium. Chapter 4 presents this modified CAPM theory and its application in more detail.

Table 7-6: Size-Decile Portfolios of the NYSE/AMEX/NASDAQ
10th Decile Sub-Portfolios

Decile	Recent Number of Companies	Market Capitalization of Largest Company (in Thousands)	Company Name
10a	388	235,647	McClatchy Company
10w	221	235,647	McClatchy Company
10x	167	179,316	Furmanite Corporation
10b	1,294	143,379	Callon Petroleum Company
10y	304	143,379	Callon Petroleum Company
10z	990	85,670	Visteon Corporation

Note: These numbers may not aggregate to equal decile 10 figures.

Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

Market capitalization and name of largest company in each decile as of September 30, 2010.

This phenomenon can also be viewed graphically, as depicted in Graph 7-2. The security market line is based on the pure CAPM without adjustment for the size premium. Based on the risk (or beta) of a security, the expected return lies on the security market line. However, the actual historic returns for the smaller deciles of the NYSE/AMEX/NASDAQ lie above the line, indicating that these deciles have had returns in excess of that which is appropriate for their systematic risk.

Further Analysis of the 10th Decile

The size premia presented thus far do a great deal to explain the return due solely to size in publicly traded companies. However, by splitting the 10th decile into further size groupings we can get a closer look at the smallest companies. This magnification of the smallest companies will demonstrate whether the company size to size premia relationship continues to hold true.

Ibbotson first split the 10th decile into 10a and 10b in the 2001 Ibbotson SBBI Valuation Yearbook. In the 2010 Ibbotson SBBI Valuation Yearbook, we introduced an even closer look at the smallest companies by splitting 10a into 10w and 10x, and splitting 10b into 10y and 10z.

As previously discussed, the method for determining the size groupings for size premia analysis was to take the stocks traded on the NYSE and break them up into 10 deciles, after which stocks traded on the NYSE AMEX and NASDAQ were allocated into the same size groupings. This same methodology was used to split the 10th decile into four parts: 10w, 10x (sub-portfolios of 10a), and 10y, and 10z (sub-portfolios of 10b). Splitting the 10th decile into 10a and 10b is equivalent to breaking the stocks down into 20 size groupings, with portfolios 19 and 20 representing 10a and 10b. Further splitting 10a into 10w and 10x and 10b into 10y and 10z is equivalent to breaking the stocks down into 40 size groupings, with portfolios 37 and 38 representing 10w and 10x, and portfolios 39 and 40 representing 10y and 10z.

Table 7-7 shows that the pattern continues; as companies get smaller their size premium increases. There is a noticeable increase in size premium from 10a to 10b, and the portfolio made up of the smallest companies, 10z, has the largest size premium, which is demonstrated visually in Graph 7-3. This can be useful information in valuing companies that are extremely small. Table 7-6 presents the size, composition, and breakpoints of each size category. First, the recent number of companies and total decile market capitalization are presented for each of the portfolios. Then the market capitalization and name of the largest company is presented. Breaking the smallest decile down lowers the significance of the results compared to results for the 10th decile taken as a whole, however. There are always going to be more companies included in the Micro-cap than in the 10th decile, and more companies in the 10th decile than in the 10b category. The more stocks included in a sample, the more significance can be placed on the results. The 10th decile gets as small as 49 companies back in March of 1926. This is still significant.

While this is not as much of a factor with the recent years of data, these size premia are constructed with data back to 1926. By breaking the 10th decile down into smaller components we have cut the number of stocks included in each grouping. The change over time of the number of stocks included in the 10th decile for the NYSE/AMEX/NASDAQ is presented in Table 7-8. With fewer stocks included in the analysis early on, there is a strong possibility that just a few stocks can dominate the returns for those early years. While the number of companies included in the 10th decile for the early years of our analysis is low, it is not too low to demonstrate that the company size to size premia relationship continues to hold true, even when broken down into subdivisions 10a, 10w, 10x, 10b, 10y, and 10z.

All things considered, size premia developed for these portfolios are significant and can be used in cost of capital analysis. These size premia should greatly enhance the development of cost of capital analysis for very small companies.

Overlapping Size Categories

A common question among valuation practioners is about how to use the various size premium metrics that Morningstar provides when size-based category breakpoints overlap. This issue is magnified now that we have published even more granularity for the 10th decile.

There are going to be cases when the estimated equity value for a subject could categorize it in a number of size premium buckets. This range of potential size premium choices would have a tremendous effect on the firm's enterprise value. There are two decision paths when making this choice. The improper path is to choose the size premium that achieves the self-serving goal of influencing the enterprise value in the direction most desired. In many cases this leads to choosing the highest size premium number (12.06% in Table 7-7), because this will lead to the lowest enterprise value for tax purposes, marital dissolution, acquisition valuation, etc. The proper path is to choose the size premium that is most statistically relevant for your application.

Choosing the Right Size Premium

There are two primary factors in determining which size premium to use. First, identify how close to a size category boundary your subject company falls. Second, determine how confident you are in your estimate of equity value.

Let's say you have an example where the estimated equity value is close to the top breakpoint of the 10b category, toward the middle of the 10th decile, and toward the bottom of the Micro-cap. In this case, the statistically conservative choice is the 10th decile. We need to balance the confidence that our subject firm actually falls within a particular size category with the need to tailor that size grouping as tight as possible to make the peers relevant to our analysis. The Micro-cap category is too broad for this case, since the subject firm falls in the lower range of the category, and 10b is too narrow since our subject company would barely squeeze in under the top breakpoint before sliding into 10a. We can say with confidence that the 10th decile puts our company among the most peers of similar size.

Since estimating equity value for the purpose of size premium categorization is a circular challenge, it makes sense to use as many quality metrics that are available to perform this estimate. In doing so, you may find that the equity estimates cross a number of size premium categories. In this case, it is advisable to sacrifice granularity for statistical confidence. For example, if you have three equity estimates indicating that your firm would fall in the middle of 10x, bottom of 10x, and middle of 10y categories, the overall 10th decile size premium would be the best category to capture the size of similar peer companies while acknowledging that the imperfections and circular nature of the size bucketing process.

Table 7-7: Long-Term Returns in Excess of CAPM Estimation for Decile Portfolios of the NYSE/AMEX/NASDAQ, with 10th Decile Split

	Beta*	Arithmetic Mean Return (%)	Realized Return in Excess of Riskless Rate** (%)	Estimated Return in Excess of Riskless Rate† (%)	Size Premium (Return in Excess of CAPM) (%)
1	0.91	10.92	5.76	6.14	-0.38
2	1.03	12.92	7.76	6.95	0.81
3	1.10	13.56	8.39	7.39	1.01
4	1.12	13.91	8.75	7.55	1.20
5	1.16	14.75	9.59	7.77	1.81
6	1.19	14.95	9.78	7.96	1.82
7	1.24	15.38	10.21	8.34	1.88
8	1.30	16.54	11.37	8.73	2.65
9	1.35	17.16	11.99	9.05	2.94
10a	1.42	19.24	14.08	9.53	4.55
10w	1.39	18.52	13.35	9.36	3.99
10x	1.45	19.88	14.72	9.75	4.96
10b	1.38	24.46	19.30	9.24	10.06
10y	1.40	23.72	18.55	9.40	9.15
10z	1.34	26.25	21.08	9.03	12.06
Mid-Cap, 3-5	1.12	13.87	8.71	7.51	1.20
Low-Cap, 6-8	1.23	15.38	10.22	8.24	1.98
Micro-Cap, 9-10	1.36	18.37	13.20	9.12	4.07

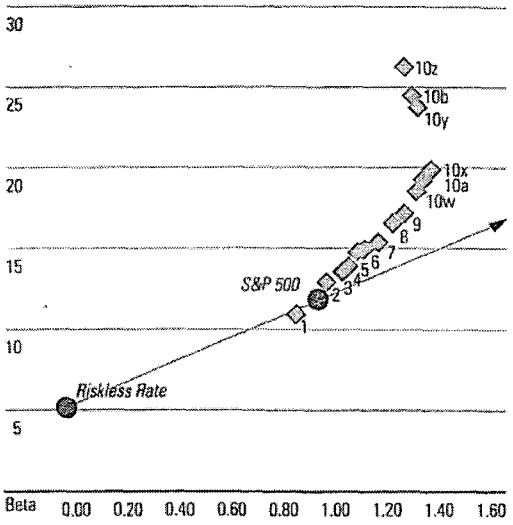
Data from 1926–2010. Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

*Betas are estimated from monthly portfolio total returns in excess of the 30-day U.S. Treasury bill total return versus the S&P 500 total returns in excess of the 30-day U.S. Treasury bill, January 1926–December 2010 .

**Historical riskless rate is measured by the 85-year arithmetic mean income return component of 20-year government bonds (5.17 percent).

†Calculated in the context of the CAPM by multiplying the equity risk premium by beta. The equity risk premium is estimated by the arithmetic mean total return of the S&P 500 (11.88 percent) minus the arithmetic mean income return component of 20-year government bonds (5.17 percent) from 1926–2010.

Graph 7-3: Security Market Line versus Size-Decile Portfolios of the NYSE/AMEX/NASDAQ, with 10th Decile Split



Data from 1926–2010.

Table 7-8: Historical Number of Companies for NYSE/AMEX/NASDAQ Decile 10

Sept.	Number of Companies
1926	52*
1930	72
1940	78
1950	100
1960	109
1970	865
1980	685
1990	1,814
2000	1,927
2005	1,746
2006	1,744
2007	1,775
2008	1,626
2009	1,415
2010	1,320

Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

*The fewest number of companies was 49 in March, 1926

Alternative Methods of Calculating the Size Premia

The size premia estimation method presented above makes several assumptions with respect to the market benchmark and the measurement of beta. The impact of these assumptions can best be examined by looking at some alternatives. In this section we will examine the impact on the size premia of using a different market benchmark for estimating the equity risk premia and beta. We will also examine the effect on the size premia study of using sum beta or an annual beta.[5]

Changing the Market Benchmark

In the original size premia study, the S&P 500 is used as the market benchmark in the calculation of the realized historical equity risk premium and of each size group's beta. The NYSE total value-weighted index is a common alternative market benchmark used to calculate beta. Table 7-9 uses this market benchmark in the calculation of beta. In order to isolate the size effect, we require an equity risk premium based on a large company stock benchmark. The NYSE deciles 1–2 large company index offers a mutually exclusive set of portfolios for the analysis of the smaller company groups: mid-cap deciles 3–5, low-cap deciles 6–8, and micro-cap deciles 9–10. The size premia analyses using these benchmarks are summarized in Table 7-9 and depicted graphically in Graph 7-4.

Table 7-9: Long-Term Returns in Excess of CAPM Estimation for Decile Portfolios of the NYSE/AMEX/NASDAQ, with NYSE Market Benchmarks

	Beta*	Arithmetic Mean Return (%)	Realized Return in Excess of Riskless Rate** (%)	Estimated Return in Excess of Riskless Rate† (%)	Size Premium (Return in Excess of CAPM) (%)
1	0.99	10.92	5.76	5.91	-0.15
2	1.11	12.92	7.76	6.66	1.10
3	1.17	13.56	8.39	7.02	1.38
4	1.20	13.91	8.75	7.19	1.56
5	1.23	14.75	9.59	7.36	2.22
6	1.26	14.95	9.78	7.53	2.25
7	1.32	15.38	10.21	7.88	2.33
8	1.38	16.54	11.37	8.25	3.12
9	1.42	17.16	11.99	8.52	3.46
10	1.48	20.97	15.81	8.87	6.94
Mid-Cap, 3-5	1.19	13.87	8.71	7.13	1.58
Low-Cap, 6-8	1.30	15.38	10.22	7.79	2.43
Micro-Cap, 9-10	1.43	18.37	13.20	8.58	4.61

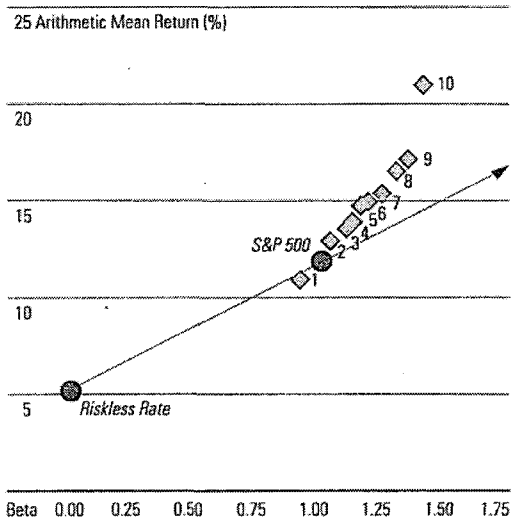
Data from 1926–2010. Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

*Betas are estimated from monthly portfolio total returns in excess of the 30-day U.S. Treasury bill total return versus the CRSP Deciles 1–2 total returns in excess of the 30-day U.S. Treasury bill, January 1926–December 2010.

**Historical riskless rate is measured by the 65-year arithmetic mean income return component of 20-year government bonds (5.17 percent).

†Calculated in the context of the CAPM by multiplying the equity risk premium by beta. The equity risk premium is estimated by the arithmetic mean total return of the CRSP Deciles 1–2 (11.15 percent) minus the arithmetic mean income return component of 20-year government bonds (5.17 percent) from 1926–2010.

Graph 7-4: Security Market Line versus Size-Decile Portfolios of the NYSE/AMEX/NASDAQ, with NYSE Market Benchmarks



Data from 1926–2010.

For the entire period analyzed, 1926–2010, the betas obtained using the NYSE total value-weighted index are higher than those obtained using the S&P 500. Since smaller companies had higher betas using the NYSE benchmark, one would expect the size premia to shrink. However, as was illustrated in Chapter 5, the equity risk premium calculated using the NYSE deciles 1–2 benchmark results in a value of 5.99, as opposed to 6.72 when using the S&P 500. The effect of the higher betas and lower equity risk premium cancel each other out, and the resulting size premia in Table 7-9 are slightly higher than those resulting from the original study.

Measuring Beta with Sum Beta

The sum beta method attempts to provide a better measure of beta for small stocks by taking into account their lagged price reaction to movements in the market. [See Chapter 6.] Table 7-10 shows that using this method of beta estimation results in larger betas for the smaller size deciles of the NYSE/AMEX/NASDAQ while those of the larger size deciles remain relatively stable. From these results, it appears that the sum beta method corrects for possible errors that are made when estimating small company betas without adjusting for the lagged price reaction of small stocks. However, the sum beta, when applied to the CAPM, still does not account for all of the returns in excess of the riskless rate historically found for small stocks. Table 7-10 demonstrates that a size premium is still necessary to estimate the expected returns using sum beta in conjunction with the CAPM, though the premium is smaller than that needed when using the typical calculation of beta.

Graph 7-5 compares the 10 deciles of the NYSE/AMEX/NASDAQ to the security market line. There are two sets of decile portfolios—one set is plotted using the single variable regression method of calculating beta, as in Graph 7-2, and the second set uses the sum beta method. The portfolios plotted using sum beta more closely resemble the security market line. Again, this demonstrates that the sum beta method results in the desired effect: a higher estimate of returns for small companies. Yet the smaller portfolios still lie above the security market line, indicating that an additional premium may be required.

Table 7-10: Long-Term Returns in Excess of CAPM Estimation for Decile Portfolios of the NYSE/AMEX/NASDAQ, with Sum Beta

	Beta*	Arithmetic Mean Return (%)	Realized Return in Excess of Riskless Rate** (%)	Estimated Return in Excess of Riskless Rate† (%)	Size Premium (Return in Excess of CAPM) (%)
1-Largest	0.91	10.92	5.76	6.13	-0.37
2	1.06	12.92	7.76	7.09	0.66
3	1.13	13.56	8.39	7.60	0.79
4	1.20	13.91	8.75	8.05	0.69
5	1.24	14.75	9.59	8.30	1.29
6	1.30	14.95	9.78	8.73	1.05
7	1.38	15.38	10.21	9.27	0.94
8	1.49	16.54	11.37	10.04	1.34
9	1.56	17.16	11.99	10.45	1.54
10-Smallest	1.71	20.97	15.81	11.47	4.34
Mid-Cap, 3-5	1.17	13.87	8.71	7.86	0.84
Low-Cap, 6-8	1.36	15.38	10.22	9.16	1.05
Micro-Cap, 9-10	1.60	18.37	13.20	10.74	2.46

Data from 1926–2010. Source: Morningstar and CRSP. Calculated (or Derived) based on data from CRSP US Stock Database and CRSP US Indices Database ©2011 Center for Research in Security Prices (CRSP®), The University of Chicago Booth School of Business. Used with permission.

*Betas are estimated from monthly portfolio total returns in excess of the 30-day U.S. Treasury bill total return versus the S&P 500 total returns in excess of the 30-day U.S. Treasury bill, January 1926–December 2010.

**Historical riskless rate is measured by the 85-year arithmetic mean income return component of 20-year government bonds (5.17 percent).

†Calculated in the context of the CAPM by multiplying the equity risk premium by beta. The equity risk premium is estimated by the arithmetic mean total return of the S&P 500 (11.88 percent) minus the arithmetic mean income return component of 20-year government bonds (5.17 percent) from 1926–2010.

Bermuda Water Company
Summary of Cost of Capital and Fair Rate of Return

Based upon Corrections to RUCO Witness Rigsby's DCF and CAPM

Type of Capital	Ratios (1)	Cost Rate	Weighted Cost Rate
Long-Term Debt	40.00%	6.13% (1)	2.45%
Common Equity	60.00%	10.85% (2)	6.51%
Total	100.00%		8.96%

RUCO Witness Rigsby's Recommendation

Type of Capital	Ratios (1)	Cost Rate (1)	Weighted Cost Rate
Long-Term Debt	40.00%	6.13%	2.45%
Common Equity	60.00%	9.00%	5.40%
Total	100.00%		7.85%

Notes:
(1) From Schedule WAR - 1, page 1.
(2) From page 2 of this Schedule.

Bermuda Water Company
Brief Summary of Common Equity Cost Rate

Line No.		RUCO Witness Rigsby's Original Methodology		RUCO Witness Rigsby's Corrected Methodology	
1.	Discounted Cash Flow Model (DCF) (1)				
a.	Dividend Yield	3.11%	(1)	3.11%	(2)
b.	Growth Rate	6.17%	(1)	8.49%	(2)
c.	DCF Indicated Common Equity Cost Rate	9.28%		11.60%	
2.	Capital Asset Pricing Model (CAPM)				
a.	Risk-Free Rate	1.52%	(3)	4.67%	(4)
b.	Market Equity Risk Premium	5.45%	(5)	8.16%	(4)
c.	Beta	0.75	(3)	0.75	(4)
d.	Traditional CAPM Indicated Common Equity Cost Rate	5.61%		10.79%	
e.	Empirical CAPM Indicated Common Equity Cost Rate	NA		11.30%	
f.	Average CAPM Indicated Common Equity Cost Rate	5.61%		11.05%	
3	Average DCF and CAPM Indicated Common Equity Cost Rates	7.44%		11.33%	
4.	Financial Risk Adjustment (6)	NA		-0.98%	
5.	Business Risk Adjustment (7)	NA		0.50%	
6.	Indicated Common Equity Cost Rate	7.44%		10.85%	
7.	Recommended Common Equity Cost Rate	9.00%	(8)	10.85%	(9)

Notes:
(1) From Schedule WAR - 2.
(2) From Schedule PMA-4
(3) From Schedule WAR - 7, page 1.
(4) From Schedule PMA-6, page 1.
(5) Average market equity risk premium from Schedule WAR 7, pages 1 and 2.
(6) Developed on pages 39 - 41 of Ms. Ahern's accompanying rebuttal testimony.
(7) Developed on pages 41 - 17 of Ms. Ahern's accompanying rebuttal testimony.
(8) From Schedule WAR-1, page 1.
(9) Sum of Line Nos. 3, 4, 5, and 6.